FOOD INDUSTRIES

manufacturing and processing

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Preservation of Foodstuffs Facilitates All-Year Diet Variety

NATURE provided that the growth and harvesting of most foodstuffs should be seasonal operations. A specific period of consumption synchronized roughly with the period of harvesting, except in rare instances, until the ingenuity of man made possible the preservation of even the most perishable of foodstuffs by simple drying, by refrigeration, by processing and protective packaging. The housewife has accepted the outcome of an elaborate program of investigation and scientific research as a matter of course.

- - - The new philosophy of preservation has been systematized to such an extent that the purchase and consumption of strawberries in February, for instance, is no longer regarded as evidence of extravagance. Developments that first permitted such a disregard of season, and relegated to a position of secondary importance the factors of geography and climate, followed the intensive application of under-cover cultivation, and the utilization of refrigeration for preservative purposes. As a result, the size of the purse, not the season, is the determining factor in food selection.

- - - Developing and applying technical engineering methods in preparation and distribution has resulted in an interchange of prepared and perishable commodities between states and between countries, the effect of which has been highly beneficial to all concerned. It is the task of the food engineer—to coin a new term—to improve and cheapen methods of preparation and preservation so that the size of the purchaser's purse will become of less and less moment.

- - - Variety in diet is no longer considered a luxury; it has been proved a necessity to good health. A realization of the full import of this, in turn, has stimulated keener interest and a spirited rivalry in meeting existing public tastes and in creating new ones. No greater opportunity for solid progress has before occurred in any branch of American industry; but he who would succeed in the marketing of a prepared or processed food must adopt the most scientific methods and achieve a high standard of efficiency in manufacture and distribution. It is not enough that he use the best methods available in his own branch of the food industry. He must go ahead for inspiration and suggestion—as to reduction in cost and improvement of product—into the other allied food industries, even into fields of industrial processing that appear to be but remotely connected with his own immediate problem.

- - - To succeed in the manufacture of foodstuffs, under the highly competitive conditions existing today, involves the careful selection of raw material and the scientific control of standards, the scrapping of obsolete plant and the substitution of efficient equipment, and the adoption of modern methods and policies in processing, packaging and merchandising. The opportunity for variety in the evolution and selection of new methods is almost unlimited. He who makes the earliest decision to abandon a policy of isolation as to viewpoint, and who has the courage to discard inefficient equipment, will be the first to benefit, and to the greatest extent, from the growing demand for the best, at home and abroad.

Advertising Should Be Clean and Constructive

IN THE PRESENT LIVELY TUSSLE for as large as possible a share of the consumer's food dollar, much special pleading is to be expected. If essentially true, unilateral argumentation may be condoned because of the perfectly natural self-centered point of view of the manufacturer of each specific food.

In planning advertising campaigns it is well to bear in mind that authoritative bio-statisticians have admonished us that the present average diet differs from that of the pre-advertising era in nature but not in amount. In other words, one can apparently alter the diet of a nation, but, so far, no measurable increase has been effected by dietary propaganda.

It is equally obvious that successful advertising must, necessarily, generate a feeling of confidence. This, in turn, depends upon several of the many constituent factors of this highly effective though long-distance form of salesmanship, all of which are embraced and defined with fair accuracy by the term "good taste." Violations of this prime essential are likely to bring disaster to the offending advertiser, incidentally injuring more or less grievously the good name of general advertising.

Speaking generally, the use of invidious comparisons in advertising copy has in the past been regarded as anathema, at least among the more intelligent advertising men. Apparently forgetful of its responsibilities as a leading user of advertising space, comes now the American Tobacco Company, with its high-pressure campaign in favor of Lucky Strike cigarettes, based upon and confined almost entirely to a definite, and most invidious, comparison of cigarette smoking with the use of sweets in the diet. The sponsors of this propaganda are playing with fire: and any adult citizen of fairly retentive memory can tell them why.

Wider Markets and Closer Budgets Are Not Always Panaceas

FREQUENTLY the contention is advanced that a particular industry has only one problem to face—markets and distribution; and that survival, if not prosperity, rests entirely on the successful solution of this problem. In rare instances such a deduction is justified; but a closer examination of conditions usually discloses the fact that greater attention should have been paid to opportunities existing for more efficient handling by the mechanization of processes, the wider use of electric power, the replacement of batch operation by continuous operation, the employment of an adequate research staff, and the wider application of science to industry—these are some of the major avenues that invariably lead to better products and higher profits. The concentration of all concern and investigation in the direction of marketing and distribution often indicates a failure to face facts in the plant. Rarely can an attitude of satisfied complacency as to the technical and engineering phases of the work be viewed other than as hazardous to the well-being of the enterprise.

Science never finishes its job, and technical ingenuity is not a tool that can be safely discarded after an initial application. Yet the attitude of many reminds us of the advice: "Give him a book for Christmas," which elicited the reply, "No; he already has one." Some individuals are content to have flirted with scientific processing and economical mechanization in their plants, and then expect to receive the benefits that can only result from continuous research in quest of opportunities for the technical betterment of operations. As Mr. G. E. Schulz maintained at a recent meeting of the Taylor Society, in New York: Some industries cannot be revived by wider markets and closer attention to budgets. Such help, he maintained, may be compared to the practice of hitching fancy harnesses and new buggies to old horses, whereas the need is for a complete motor vehicle as developed by science and engineering.

Avoiding the Personal Element in Process Control

UNTIL recently most of the food industries have been slow to substitute automatic instruments in place of the customary hand control of temperature, pressure, and time in the operation of processing plants. The fruit and vegetable canning industries have been good examples of this conservatism. A nation-wide survey recently made by the Fruit Products Division of the University of California disclosed the fact that many canners who sterilize foods under pressure do not use temperature-recording or temperature-control instruments, but rely entirely on the personal element, despite the fact that comparisons of hand control and automatic control under working conditions have demonstrated that the former invariably gives irregular heating, holding, and cooling curves, as demonstrated by means of recording thermometers. During the operation of several retorts, steam may be taken temporarily in large volume to supply the needs of some other process, such as lye peeling or blanching. The retorts at such a time receive an inadequate amount of steam. The operator may open a valve to supply more steam to the retorts, but he usually fails to close it promptly enough when the emergency is past, with the result that the product may be over-heated. If the retort be loaded with glass containers, the lids may be blown off the jars because of excess internal pressure.

Automatic control has been demonstrated to give a uniform "coming-up" curve, a regular "holding" curve, and a uniform cooling curve. The abandonment of manual control makes for more uniform cooking, and thus for more uniform quality, in addition to saving labor and steam. The automatic recording of temperature is almost a necessity in connection with the dehydration of foods, and automatic control is highly desirable. Nevertheless, most common evaporators, such as are used for hops, apples, and prunes, do not boast of even a recording thermometer; and few, even among modern units, are equipped with automatic temperature-control devices.

In defence of the canners, however, it should be recorded here that many large organizations, particularly in the West, have equipped their pressure sterilizers with automatic control devices; and, what is more, they are using them regularly, and are enthusiastic about results. Many fruit canners have also equipped their continuous sterilizers with automatic temperature-control instruments of simple and strong construction, and have found that they are saving much steam and are getting

far more uniform cooking of the fruit than was possible in the old days of hand control. Jelly manufacturers have also made profitable use of temperature-recording thermometers for following the concentration of each batch and for providing a record of each cook. In California, the packers of foods that are sterilized under pressure are now under the supervision of the State Board of Health; and every batch of canned or glass-packed food that comes under the Board's supervision must be sterilized in a retort equipped with a temperature recorder, and each chart must be kept on record and numbered to correspond with the batch number of the product. Under-processing is thereby noticed before the neglect can cause damage to the industry as a result of spoilage. Public confidence in such preserved foods has been greatly enhanced by this precaution, and although the canners at one time might have thought that something was being "put over" on them by the authorities, they would not now be content to be deprived of temperature recorders and the resultant insurance to progress and profits that has been provided by the system of control in operation by the State Board of Health. Many other opportunities are apparent in the food industries in general for the wider adoption of automatic control instruments and the avoidance of an uncertain and expensive personal element.

Research Must Have Its Background of Experience

RESEARCH, like all other human activities, must have its experience, although, oddly enough, it is frequently defined as accelerated experience. But research experience is of comparatively recent origin. The so-called experimental method—a phrase which is a toothsome morsel in the mouth of the professional educator—received its first major development in the able hands of Louis Pasteur as recently as 1850. Prior to Pasteur, men merely observed, speculated, guessed—often correctly, it is true; but Pasteur experimented. He manufactured experience with all the possible variables under his control.

Many products of recent development, such as the automobile, the airplane, phenol plastics, fixed nitrogen compounds, rayon and numerous others, had their origin in research. Progress in these industries has been no slow, age-long evolution, but rather the development of an elaborate procedure as the result of painstaking, systematically controlled experiment. Research was their origin and research is their life. In this group of industries the research department is recognized by boards of directors as the vital organ of the business.

In marked contrast is the spirit that pervades some of the older industries—those whose origin is found in prehistoric antiquity—the commonest of the useful arts, such as baking, milling, tanning, fishing, cooking, drying, laundering. The experience of mankind in these arts is measured in thousands of years. Compared with this venerable experience, research, in the modern sense, is but a child—precocious perhaps. Maturity seldom expects or welcomes advice from youth; and age-old art looks askance at science.

Yet research must have its experience. Science must somehow catch up with the art. But the question remains as to how it can catch up. Whenever the older art employs scientific research, the results desired are usually expected altogether too quickly. It forgets that its knowledge of the present is the accumulation of centuries of experience, acquired, for the most part, by accidental variation of practice. In this fact seems to lie the resistance of the older industries to the development of the new knowledge. It is a fairly accurate summation of the mental traits of man to say that the older is an industry the less one knows about it. The converse is equally true.

The older industries are facing competition from the new and vigorous developments of research, which can be "combated" only by more research. And the older industries must give research its experience before they can profit from it.

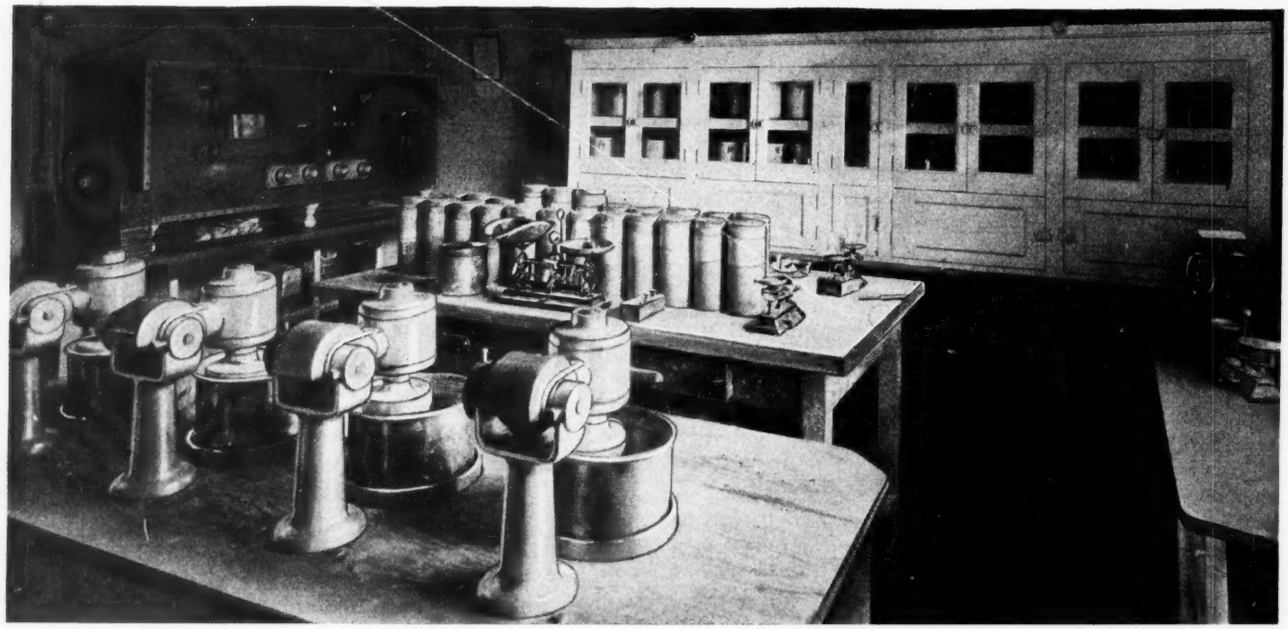
Cleanliness as an Industrial Economy and Asset

IF JOHN WESLEY were right that cleanliness is next to godliness, the food industries must aim high. Sanitation and purity are vital to every one of its branches. Uncleanly conditions cause damage to and spoilage of the product, but they have an even more important effect on public confidence. Many firms achieve effective advertising by throwing open their factories to the public. When, for example, the consumer can see flour dumped onto a conveyor at one end of the plant, and a wrapped loaf emerge at the other, untouched by human hand during the process, a markedly favorably reaction to the company and to its product results. Sloppiness or dirtiness in any part of a food plant—poor housekeeping—has a bad effect on the working force, who will, in turn, become slack in this respect.

Trouble and loss may arise from various sources. Bacteria constitute an ever-present influence in favor of deterioration. Nor is it permissible to neglect this hazard on the theory that the final product is sterilized or dried so that bacteria cannot then affect it. Anyone handling sugar has yeast to fear. If dampness and air be present, molds may form. Even with clean equipment, trouble can be spread by roaches and flies. Insect plagues are legion: weevils, worms, mites, ants—these are but a few. Rats and mice cause enormous annual loss.

Means of control are readily at hand. First in importance is the proper design and construction of equipment, to insure easy dismantling and thorough cleaning. Few persons outside a plant realize how many are the number of labor-hours that should be expended thus. Mere cleaning is insufficient: it must be followed by sterilization of the equipment. Of the various means, steam, the most common, is highly satisfactory if care be taken that the equipment is made "piping" hot—not merely warmed to a temperature favorable for the growth of bacteria. A wide variety of chemical sterilizers are on the market, chiefly with chlorine or formaldehyde as the effective agent, the use of which is sometimes restricted by local regulation, owing to the danger of transfer into the finished product, there to act as a preservative. Bad insect contamination usually requires chemical treatment—spraying, poison bait, or even gasing with hydrocyanic acid. To screen from flies is cheaper than to spray, particularly if the spray adversely affects the flavor of the product.

Each branch of the food industries has its own type of problem to face, but the basic problem and the necessity for its solution are common to all. The proverb that prevention is better than cure may be trite, but it is none the less true, especially if the cure be expensive, or impossible.



Laboratory for experimental baking and for bakery control

Technical Control in BREAD BAKING

By C. B. Morison

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FOODS made from the cereal grains and their products are economical sources of energy and protein in the diet. Wheat bread is our most popular cereal food, and the major product of the baking industry in the United States. The modern baker manufactures several classes of baked products, including bread, cake, pie, cookies, biscuits, and crackers. Each class comprises a variety of individual types, with their own distinctive properties and appeal to the consumer. The term "bread," unqualified, means wheat or white bread made from wheat flour, but many other kinds of bread are manufactured by the modern bakery and known to the trade under various names.

White bread may be classified by descriptive terms based on its form or loaf characteristics; thus we have round tops, split tops (both large and small), pullman or sandwich loaf, hearth bread, Vienna, French, and others. There are various types of whole-wheat bread, bran bread, sweet rye, sour rye bread, pumpernickel, and breads named from some characteristic ingredient, such as milk, raisin, fig, nut, honey, and many others.

Yeast-raised sweet goods include many different kinds of products. Full description of the various cakes, pastries, cookies, pies, doughnuts, biscuits and crackers would be of interest; but allusion merely to the wide variety of products made by the baking industry demonstrates that technical control in the industry as a whole has a rather wide field of general and special applications in relation to processes and products.

The production of bread, cake, pie, biscuits, and crackers is becoming more and more specialized. In consequence, a special technology adapted to large-scale commercial production has been developed for each class of these goods. We sometimes hear of bakers who are recognized experts in bread production, but who have had little or no experience in other departments of the industry. In accordance with the spirit of the times, baking is becoming more specialized.

Technical control in baking is not limited to a single class of products and processes. Its adequate treatment would include reference to all departments in the industry and their special technologies and requirements. Bread is the major product of the baking industry, and the following discussion of technical control will be concerned largely with bread and bread-making.

The object of technical control is the efficient and economical conversion of flour and other ingredients into nutritious foods that will satisfy standards of quality. The consumer is the final judge of quality, and uniformity is no small part of the problem. Uniformity in bread production requires constant supervision at all stages of the process. The technical staff of the modern bakery includes chemists and engineers. To function successfully, the laboratory must maintain close relations

with the purchasing department as well as with the production department.

Leaders in the baking industry, in common with those in milling, have recognized the value of the application of science to the progress and future development of their industries. Active interest in bakery control has made possible the organization of the American Society of Bakery Engineers, which provides a forum for the discussion of bakery production problems and publishes useful and appropriate technical bulletins. Other associations in this field are: The American Association of Cereal Chemists, originally founded by chemists in milling and now including chemists in the allied field of baking. The American Institute of Baking, which was organized in 1919 for the technical education of the baker and the study of the research and control problems of the industry; and the Biscuit and Cracker Manufacturers Association, which maintains a technical bureau for the investigation of its special problems and the education of its personnel.

The larger baking companies have organized laboratories and employ trained chemists and engineers. Many of the manufacturers of baking ingredients, including yeast, shortening, salt, milk, and flour, are bringing their technical staffs into direct contact with the control problems of the baker. Manufacturers of baking equipment, machinery, and ovens are thoroughly alive to the engineering problems of the industry, and the industrial architect and engineer specializing in bakery layouts have made important contributions to its technical progress.

Problems of Technical Control

The problems of technical control in bread making are concerned with the raw materials or ingredients, the process, and the product. These three broad divisions may be separated into the following outline for convenience in discussion:

I. Raw Materials or Ingredients
   - (*a*) Storage of raw materials
   - (*b*) Blending of flour
   - (*c*) Weighing of raw materials
   - (*d*) Formulas for the various doughs and kinds of bread

II. The Process
   - (*a*) Mixing the dough
   - (*b*) Fermentation of dough—straights and sponges
   - (*c*) Mechanical operations of dividing, rounding, molding, and panning dough
   - (*d*) Proofing of dough
   - (*e*) Baking

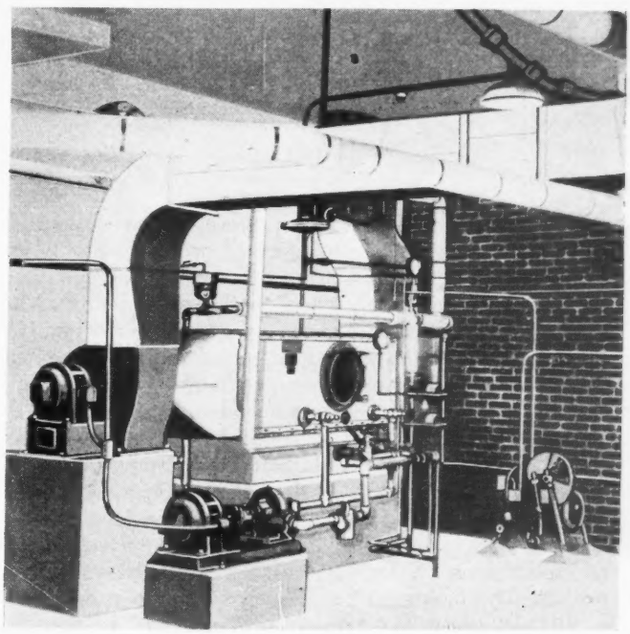
III. The Product.
   - (*a*) Cooling
   - (*b*) Wrapping; protection of product
   - (*c*) Quality of product; nutrition.

Raw Materials or Ingredients

The basic or primary ingredients of bread-making are flour, water, salt, and yeast. Secondary ingredients required in modern bread formulas are sugar, malt extract, and sources of fermentable carbohydrates; various kinds of milk (liquid milk, sweetened condensed milk, dry milk); shortenings (lard and hydrogenated fats). The production of sweet goods—cake, pastry, pie, biscuits, and crackers—requires a much more extensive list of ingredients, including eggs, butter, chemical leavening agents, nuts, fruits, spices, and flavoring extracts.

For the information of the purchasing and production departments of the bakery, the laboratory tests the quality of ingredients in relation to grade, standards, or specifications. Analytical methods and tests are available for the examination of most baking ingredients. Many of these have been worked out by the Association of Official Agricultural Chemists and some by the American Association of Cereal Chemists. These associations have published compilations of methods that are of great value to the work of the control laboratory. Constant scrutiny of ingredients by the laboratory is the best safeguard against adulteration and inferiority. Pure ingredients are demanded for quality products and inferior grades and substitutes are eliminated by systematic testing before purchase. Grade in relation to price can be checked by the laboratory and reflected in decreased cost of ingredients and maintenance of nutritive value.

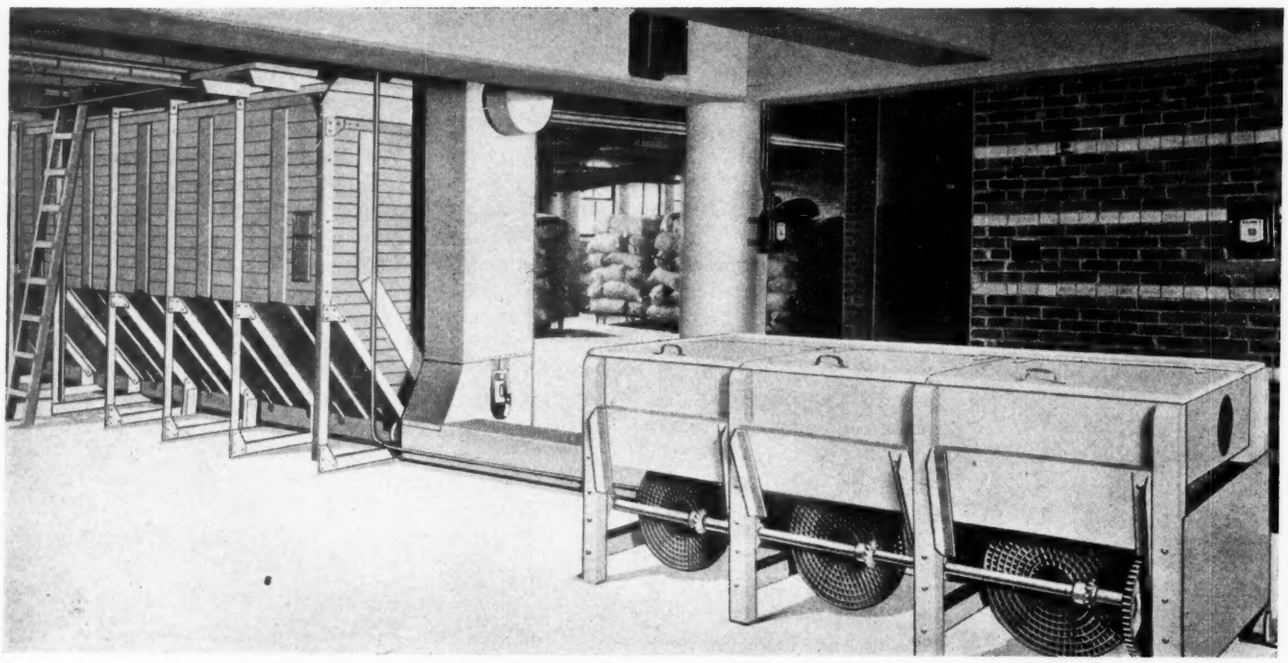
The basic ingredient of bread and other baked products is flour. Bakeries require various grades and types of wheat and rye flour. Wheat is a biological variable,



Air conditioner, for washing, purifying and controlling the temperature of air where doughs are being fermented

and flour is not a product that will have exactly the same baking characteristics year in and year out. Flour is not comparable to a product such as steel, the composition of which can be fixed by the manufacturer. Modern milling aims to select and blend wheat on the basis of tests and a highly developed milling technique for the production of uniform flour of required color, composition, and baking value. Uniformity is the aim of flour milling, and though some degree of uniformity is possible, the baker is confronted each year by the problem of flour, just as the miller is confronted by that of wheat; and the farmer by environmental influences in relation to yield, freedom from injury and grade. The control laboratory has for its most responsible problem that of the testing of flour, and the report spells success or failure for the chemist.

Routine examination of flour includes determinations of moisture, protein, and ash content for the purpose of checking up on claims. The moisture content of flour has been fixed by a federal standard. Excessive water is objectionable as a make-weight and adulterant, and is



Blender and flour bin

conducive to deterioration in storage and injury by micro-organisms. Determination of protein is highly important; it is an original price factor in wheat buying, and associated by quantity and quality relations to baking value. Determination of ash is a useful method for checking up on the grade or degree of milling of a flour.

Descriptive terms as applied to flour grades are confusing and have not been standardized, because of differences in wheat composition, milling practice, and traditional use of terms that do not mean the same to the miller, the flour broker, or the baker. Claimed grade in milling terminology is best checked by the laboratory in accordance with production requirements. Dress, color, and absorption of flour are other subjects of control interest. The biological condition of flour in reference to count and presence of micro-organisms is another important part of flour control. The presence of certain bacteria is a primary causative factor in the future development of rope in the product. Degree of infection may be determined by a suitable bacterial spore count. Whole-wheat flour especially should be subjected to such biological tests. Mold infection is readily determined by microscopic and cultural methods.

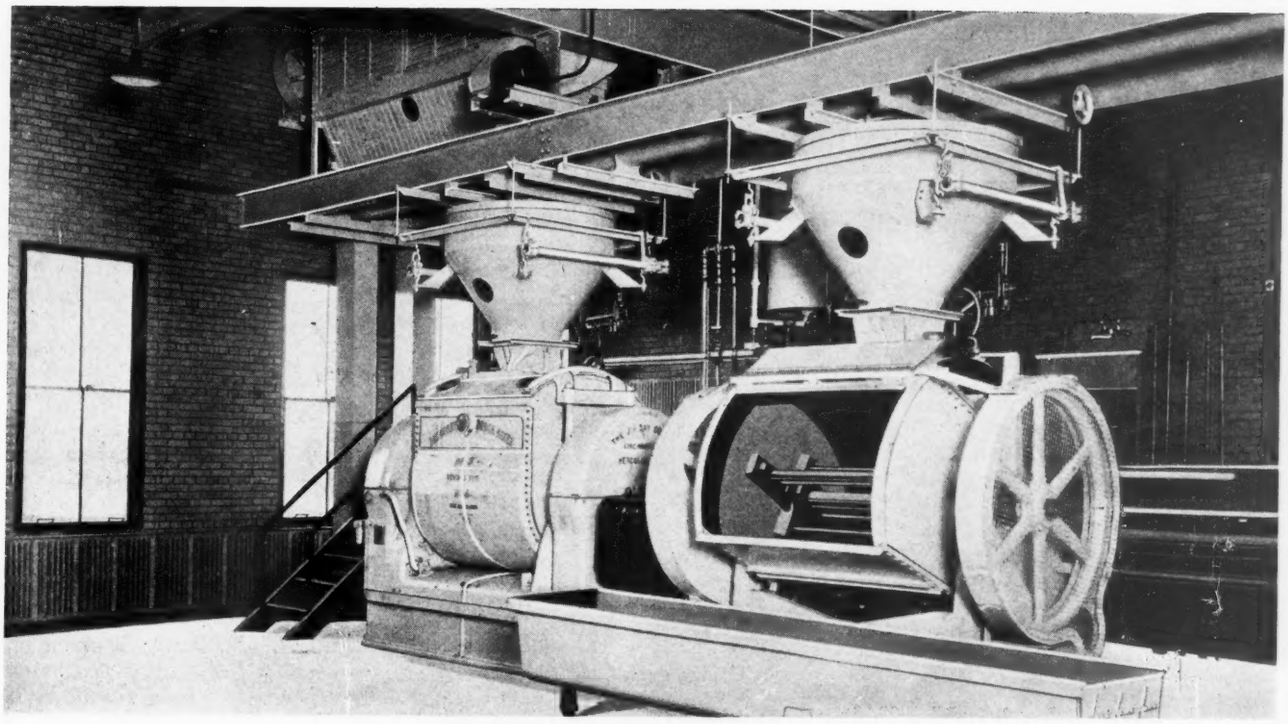
The determination of the baking value of a flour is the outstanding problem of ingredient control. Consensus of opinion among technical and scientific authorities indicates that the baking test is the most practical procedure now available for the purpose. Recently this subject has been reviewed by chemists in milling and baking, and a committee of the American Association of Cereal Chemists has recommended a standard procedure which aims at uniformity of practice among different laboratories and makes possible data that are relatively comparable. Interpretation of any baking test or system of tests requires experience and a background of data collected from many tests on all types of flour. Satisfactory recommendations for use under any given set of shop conditions require close contact by the laboratory with the production department.

The evaluation of cake flour is now being reviewed by authorities on cake making, and a committee of the American Association of Cereal Chemists is actively studying the problem in the interest of uniformity, standardization, and interpretation of results. Mention has been made of some of the subjects in the flour-control problem that are a part of the usual laboratory routine, but special investigations may be required for a more extended diagnosis of flour characteristics and properties. These more extended studies may include such factors as the hydrogen-ion concentration, buffer value, enzymatic activity, gas-retention properties, viscosity, plasticity, and many others. Some of these factors, such as the determination of the hydrogen-ion concentration or pH of flour and the viscocity or plasticity, have become a part of the laboratory routine in some organizations.

Examination and testing of the other ingredients used in baking involve many problems of composition in relation to fermentation, and the quality and nutritive properties of the bread. Each ingredient is a problem in itself and must be worked out in relation to production and other requirements.

Bakers' yeast is on a parity with flour as an essential bread ingredient. It, also, is inherently a biological variable, and the present high-quality compressed yeast is made possible only by a high degree of manufacturing control based on years of continued technical and scientific research in a highly complex field of biochemistry. The storage problems of raw materials control are especially important in relation to flour and yeast, in which temperature and humidity control are among the chief factors.

The percentage system of expressing formulas is considered to be the most satisfactory and accurate for controlled production. Correct balance and adjustment of ingredients in the formulas is related to their composition and properties, fermentation requirements, kind of product to be made, nutritive properties and its quality and costs. Improper blending of flour, and unbalanced formulas caused by lack of knowledge of flour characteristics and ingredient composition and properties entail economic losses. Scales and measures should be accurate



Dough mixers and fermenting trough

and the operation of weighing and measuring should be under responsible control. Standardization of formulas is required for efficient production control.

The Process

The first stage of the process of bread-making is the mixing of the ingredients. The object of mixing is the uniform incorporation of the ingredients into a dough of required consistency. Hydration (absorption of water), the swelling of flour proteins, and enzymatic activities begin during the mixing. The effects of mechanical mixing on the physical properties of the gluten is of much importance, and varies with different types of flours. Proper mixing requires attention to time, temperature, and speed of mixing in relation to the type of mechanical dough mixer employed. The mechanical dough mixers used in the baking industry include various designs and capacities, which may be operated at various speeds, high, medium, and low. In design and construction they represent a high degree of mechanical development.

Control of mechanical dough mixing is most important and requires strict supervision if uniform doughs of required consistency are to be expected. Appliances for the control of mixing have been subjects of recent study, due to a more general appreciation of the effect of high-speed mixing on so-called gluten development. Technical progress in this field is highly desirable.

The two common methods of mixing are for straight and sponge doughs. Variations and combinations of the two are found in practice. In straight doughs all ingredients are mixed in one operation. In sponge doughs a portion of the flour, water, yeast, and other ingredients are first mixed to form a sponge; this is allowed to ferment for the proper time; returned to the mixer; and mixed with the remainder of the ingredients called for by the formula into a final dough.

For the best results, the preparation and order of adding the ingredients to the mixer varies, and is standardized in the best practice. Poorly controlled and insufficient mixing is reflected in the quality of the product.

The mixed dough which is undergoing fermentation during mixing is emptied into the troughs at the required temperature. Doughs are fermented in a suitable room under automatic temperature and humidity control. Manufactured weather is now available to the baker by the installation of systems of air-conditioning equipment. A record of daily temperature and humidity conditions in fermentation rooms is readily obtained by the use of self-registering instruments. Accurate thermometers for the observation of dough temperatures are essential to fermentation control for which there is no substitute.

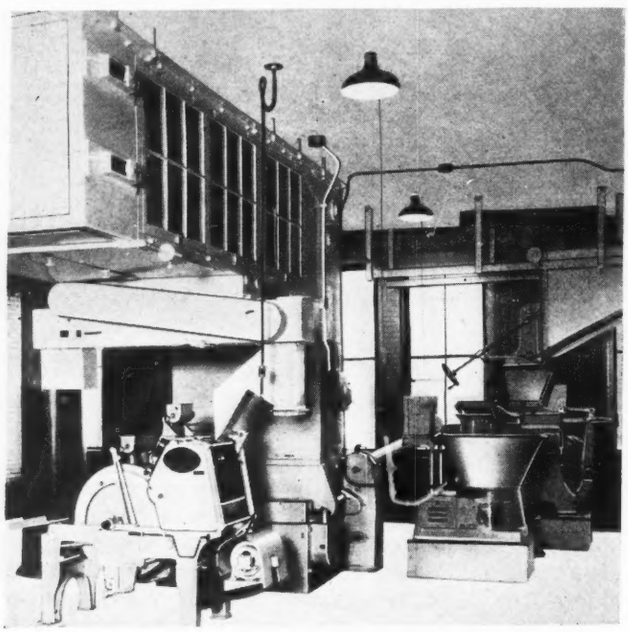
Fermentation

The fermentation of bread doughs from the scientific point of view is a highly complex phenomena involving chemical and physical changes which do not lend themselves readily to complete and satisfactory description or explanation. Inherent variables are present in relation to yeast and enzyme activity and to concomitant changes in the physical properties of the dough. Some of these have been studied by investigators, and the fundamentals of yeast nutrition for gas production, the conditions influencing enzyme action, the hydrogen-ion concentration, and the effects of various inorganic and organic constituents and the products of yeast and bacterial activity on the gas-retention and physical properties of dough may be noted as important factors in the problem.

Practical measures for influencing yeast and enzymatic activity and the physical properties of the dough refer back to flour characteristics, stability, and fermentation tolerance, and the composition and properties of ingredients present in the dough. Practice requires the production of a dough that may be sent down to the machines, made up, panned, proofed, and loaded into the oven at the proper stage of maturity in order to make the best loaf of bread. Fermentation changes are active

in dough until the temperature of baking kills the living yeast cells and stops enzyme action. Fermentation conditions must necessarily be closely supervised from mixing to baking.

Determination of the proper fermentation period or time, which extends from the end of mixing until the dough is judged ready for the machine, requires experience, and is related to the time of passage through the machines, and the final proof. Absolute control methods for the determination of the fermentation period have not yet been satisfactorily worked out to meet the requirements of practice. Doughs must be run on a strict time schedule, and exact chemical and physical methods have not yet supplanted the judgment of the expert. The proper manipulation of the dough during fermentation, punching or folding and turning the dough for the purpose of expelling excess gas and other volatile fermentation products, tends to equalize the temperature in the large mass of dough, brings the oxygen and the air into contact with it, and makes for a more even distribution of yeast cells and uniform gas dispersion. Speed or rate of fermentation may be influenced by appropriate measures. The technique of fermentation is varied for different types of doughs (sponges and straights), with due attention to minimum fermentation losses. Progress in a better knowledge of all fermentation variables, their significance and inter-relations, is dependent upon scientific research in this difficult field of process control.



Make up department, showing divider, rounder, proofer, and molder

Mechanical Operations

After fermentation the dough is sent through the machines, each of which has its problems of efficient technical control and in which the effects on the fermented dough are highly important. The various types of automatic machinery used in the mechanical handling of dough have reached a high degree of development, and improvements in special design and construction are constantly being made by the manufacturers. A completely automatic mechanical bakery layout has been made possible by such machinery. The fermented dough is sent to the divider for division, or scaling, into unit weights. Efficient divider control requires careful attention to scaling weight, which must be carefully checked to prevent economic loss, and due attention should be given to its adjustment and lubrication.

The scaled dough is rounded in one of the various types of this machine for the purpose of forming a film over the dough for gas retention, since the dough as it comes from the divider exposes a cut surface permeated by gas cells. Proper attention must be given to rounding, especially in regard to pressure and its influence on the consistency or stiffness of the rounded ball of dough. Kind and quantity of flour for dusting the rounded dough is used according to conditions. The rounded dough passes to the automatic proofer, where it remains for a period the length of which is determined by the dough's characteristics for expansion after the mechanical handling by the divider and rounder. Favorable conditions must be established in automatic proofers for this requirement.

The dough passes from the automatic proofer to the molding machine. Molding is a highly important stage in the process, and improper molding will reflect itself in poor quality of the product. Proper adjustment and care of the molder is necessary for quality production. After molding, the dough is panned, placed on the racks, and removed to the proof box for the final rising of the dough before baking. Kind and quality of pans is an important item in production, and requirements for high-grade pans in metal and construction features have been the subject of valuable development work by the manufacturer. Proof-box control is based on regulated temperature and humidity conditions for the final rising of the dough before baking. A high degree of control may be maintained in recent types of this most important part of bakery equipment. Improper proof-box conditions react against quality in the product.

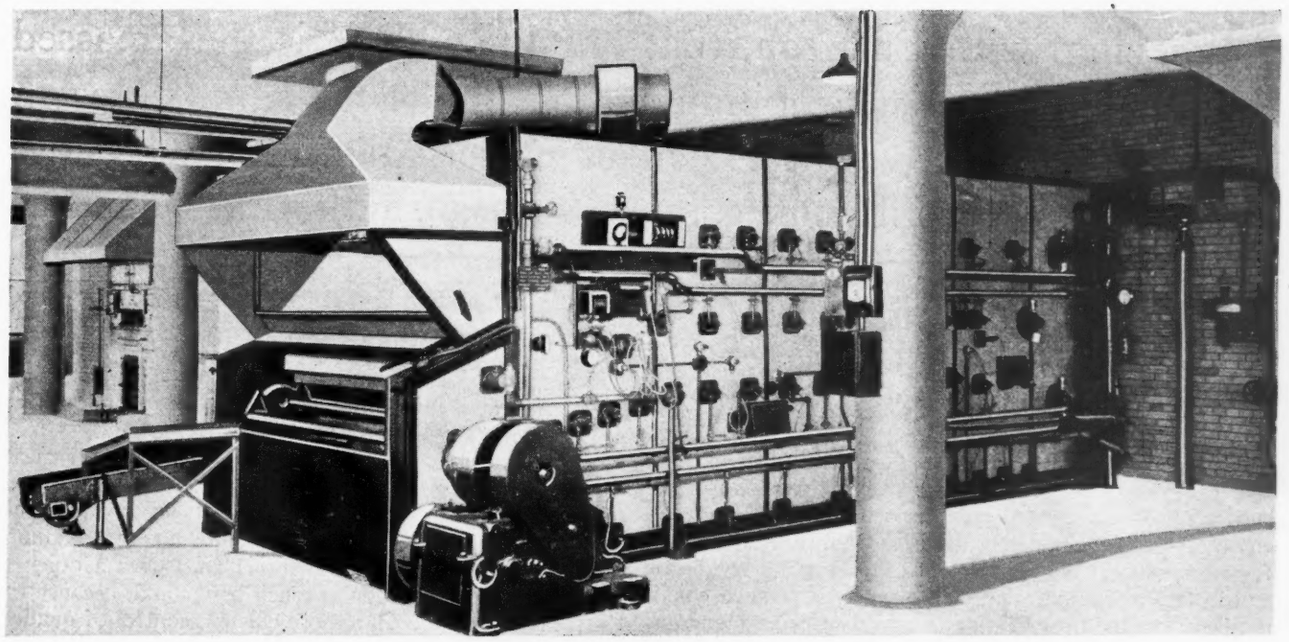
Baking

The final stage of the process is the baking of the properly fermented dough, the object of which is to obtain a well-baked product of required crust and crumb characteristics. Dough possesses a typical foam structure caused by the dispersion of the gas through the dough during fermentation. This foam structure is fixed by the coagulation of the protein by heat. Starch undergoes some degree of gelatinization, and the coagulated protein and starch exhibit changes in physical properties in the direction of elasticity.

Though the temperature of the interior of the bread during baking is near that of the boiling point of water, the exterior of the loaf is, obviously, exposed to the much higher temperature of the oven. This results in dextrinization of carbohydrates in the crust, and pyro decomposition of carbohydrates and proteins, with resulting changes in color.

The control of baking involves temperature and time of baking in relation to character of the bread and weight losses. There has been a great advance in oven design and construction, and the development of the traveling oven has greatly speeded up production. Efficient oven management and operation involve control problems of oven atmospheres, heat application, fuel or heat sources, combustion, and fuel economy.

Bread after baking must be properly cooled and protected for future distribution to the consumer. Equipment has been designed that permits the cooling of the bread under controlled conditions of temperature and



Laboratory for experimental baking and for bakery control

humidity. The wrapping of bread is a sanitary measure for the protection of the product, and ingenious automatic wrapping machinery has been designed and constructed for this purpose. Requirements and specifications for wrapping paper are checked up by the control laboratory. Quality of product is maintained by daily scoring of the bread, and bread faults eliminated as indicated.

The composition and nutritive properties of bread have been the subject of considerable investigation, and fundamental knowledge is now well established. A scientific basis of facts has made possible the production of any kind of bread required for general and special nutritive needs. It was demonstrated several years ago that a bread complete in all nutritive factors can be made on a commercial scale, and also special breads to satisfy various dietary requirements. The present popular type of bread made with milk is to be regarded as a basic component of the well-balanced diet, and its nutritive properties are well understood. A discussion of the comparative nutritive properties of different kinds of bread has provoked endless argument, but the place of bread in the diet should be considered from the standpoint of the balanced diet and from a background of comparative food properties. A sense of proportion is required for the discussion of this problem of individual and group nutrition.

The subject of technical control in this industry is such an extensive one that the general treatment of it is limited to some of its more important problems. Progress in the development of baking to its present position among the leading food industries has been made possible only by continued advance in its technical control methods. The laboratory, with its chemists and biologists, and the engineer, with his knowledge of its mechanical requirements, have become essential factors in the modern bakery organization, and leaders of the industry are now fully alive to the potential value of continued scientific and technical advance for the future of this highly important industry.

Sugar from Sawdust

Dr. Friedrich Bergius described the results of his experiments at Heidelberg on the conversion of wood into sugar by chemical processes at a luncheon recently given in his honor by the New York Chemists' Club, Although best known for his discoveries of the liquefaction of coal, Dr. Bergius may in years to come achieve equal fame as the discoverer of methods of making edible substances from wood, or from other forms of matter containing cellulose.

Dried sawdust is leached with concentrated hydrochloric acid in diffusion cells after the manner employed in the beet sugar industry, producing a syrup of high acidity. The acid is removed and recovered by mixing the solution with hot oil in a vacuum and absorbing the gaseous acid in water. Although the de-acidified syrup contains about 2 per cent of hydrochloric acid, it can be neutralized with lime and concentrated, or evaporated to dryness, and may now be used as a carbohydrate addition to stock feeds.

The sugars obtained by the Bergius process are not dextrose, nor sucrose, but, in composition, seem to lie somewhere between starch and dextrose. Their exact identity has not yet been determined, but it is known that they are digestible carbohydrates, capable of further conversion into dextrose, or corn sugar. A yield of 65 per cent of digestible carbohydrate can be obtained from wood, which is subject to a further loss of 25 per cent if refined for human consumption.

Work on the problem was started in 1913, but though the chemical studies were completed by 1916, a much longer time was required to develop the technology of the process.

Believing, with Emerson, that our knowledge is the amassed thought and experience of innumerable minds, the editors present herewith a collective discussion of preservation, in its broader aspects, each contribution coming from an authoritative source

The Meat Industry

By Rudolph A. Clemen

Armour & Company, Chicago

PRESERVATION of the food products of the meat industry has always been of great importance because of their perishable nature. Two methods have been applied—curing and freezing or chilling. The modern meat-packing industry dates back to 1875, when refrigeration became practicable, both in stationary units and in transportation. Until that time the product could not be preserved over long periods with varying temperature. Without refrigeration bacteria quickly began to deteriorate the quality of the meat. Refrigeration has the effect of checking the action of bacteria and maintaining the quality of the product.

For many years freezing the product, or chilling it, has been one of the main methods of preserving meats; but no special means had been taken to change the natural

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speed at which such freezing or chilling took place. Recently, however, a new development promises even better preservation. In the past the meat industry has frozen only a limited amount of its products. This was because in this country people do not like frozen animal products. However, in times of surplus, for example, in connection with pork products, during the last few years, the practice of freezing has grown. Instead of curing the product, more packers are freezing the meat, later on thawing it out, and curing it, as needed. By this new method the product is frozen with great rapidity. There is no opportunity for the formation of the large, sharp-pointed ice crystals that rupture the cell walls and, when the meat is defrosted, release the juices, as is the case when meat is frozen slowly. In this new quick-freezing process no damage is done to the cell structure. Freezing is done at 40 to 45 deg. below zero F. Either before or after freezing the product is packaged and placed in insulated cartons, reaching the consumer in first-class condition. This method might be applied to beef tenderloins, rounds, and chops as well as other cuts. This quick freezing saves a great deal of time, and has an economic effect of stabilizing the supplies in relation to demand.

The other important method of preservation of meat products is that of curing. This was the original method of preserving meats by treatment with salt, or such preservatives as sodium nitrate or sodium nitrite. Sodium nitrate is much the more powerful and gives a quicker result. The preservation is much better and, because of the short time involved, a more efficient control of quality is possible. In this branch of preservation considerable progress has been made, one of the notable steps being the establishment of government supervision under the federal Meat Inspection Act and the Food and Drugs Act of some twenty years ago.

The whole matter of producing high-quality products that are to be maintained at a high level of condition until they reach the consumer is a problem taken care of through the laboratory organization in any packing plant. In other words, chemical control both of primary products, such as meat, and byproducts, has made possible production on a huge scale and at the same time maintained the preservation of the quality of products.

Condensed, Evaporated and Powdered Milk

By F. L. Seymour-Jones

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WHEN the young recruit was asked with what he cleaned his rifle, he mentioned oil, flannel, and a pull through. His answer was adjudged incorrect; what he should have said was "With care." So it is in the preservation of milk products: "eternal vigilance is the price of quality." The dairy manufacturer deals with the most perishable of all foods, one indispensable to man and yet readily spoilable. He must prevent harmful bacterial and chemical change in his product and still preserve all its valuable qualities.

The oldest successful form in which milk was preserved is condensed milk, which is essentially a blend of concentrated milk and sugar. Here, the removal of water and the relatively high concentration of sugar prevent bacterial growth. Next came evaporated milk; with no added sugar and from which water has been removed, preserved by heat sterilization in sealed cans. Finally came dried milk, in which preservation is secured by the absence of moisture. Sugar, heat, and drying—simple enough, yet far more lies behind. Much in the processing is common to all three. Each is liable to its own particular troubles.

It is a commonplace truth that a high-quality product cannot be made from poor materials. Hence, although large dairy manufacturers rarely produce their raw material, care starts at the farms under their supervision. Regular veterinary inspection of cows; cleanliness at the barn; preventing contamination from manure or privies; wiping the cow's flanks and udder with a damp cloth; clean, dry hands for milking; covered pails; prompt straining of the milk; immediate cooling; storage in a milk house apart from the barn until the morning delivery; cleaning and sterilizing the milking machine—these are but a few of the many precautions necessary to insure that no bacterial contamination occur before the milk is delivered at the plant. All milk on delivery is inspected and appropriate tests are applied to make certain that the raw material is satisfactory. Cans are washed, sterilized, and dried before being returned to the farmer.

First in importance in the plant is cleanliness of equipment, which must be not only visibly clean but also bacteriologically clean. The milk must not be contamimated in the plant. Pipe lines, pumps, filling machines, and other items, are designed to be taken apart and cleaned easily. Equipment generally has all parts readily accessible for cleaning. After cleaning comes sterilization, with steam or disinfectants—usually of the chlorine type.

Bacterial growth in the milk in process is prevented in two ways. Whenever it is necessary to hold milk, it is cooled and held cold preferably at 40 deg. F. or below. The first step in processing milk from the storage tanks is to heat it in the hot wells, usually to somewhere between 185 and 212 deg. F., for a very few minutes. This not only kills all pathogenic bacteria, but also destroys practically all other bacteria. Such a short heating period has no appreciable effect on the vitamin content. This forewarming also has a beneficial effect on the keeping qualities of the product quite apart from bacteria. By inactivating any fat-splitting enzymes it prevents rancidity of the acid type. It also vitally affects the body (viscosity) of condensed and evaporated milks.

From the forewarmers the milk passes to the vacuum pan, where it is concentrated under vacuum at a temperature of around 130 to 145 deg. F. Here again the absence of air and the low heat prevent vitamin destruction. With condensed milk the necessary sugar is added to the milk in the hot wells before it is concentrated.

From here on the process varies with the product. Condensed milk is cooled in such manner that the milk sugar, which is now super-saturated, separates in very fine crystals in order to give a smooth product. It is filled into barrels or automatically into clean cans, sealed, labeled and packed into cases. Evaporated milk passes through a homogenizer which breaks up the milk fat globules to such an extent that there is no cream rise or fat separation in the product. It is then cooled and filled into cans, which are sealed and sterilized at temperatures above boiling. The finished product is sterile. Dried milk may or may not be concentrated before drying. It is dried in several ways: spray, roller, or flake process. Although not absolutely sterile, it has a very low bacterial content and the absence of moisture effectively prevents bacterial growth.

All types of milk are best kept in cool storage until shipped to market. Condensed milk kept at high temperatures thickens and becomes darker in color, with some caramelization of the sugar. Evaporated milk stored at high temperatures will in time show salt separation (insoluble calcium phosphate and citrate) which, though not deleterious, is objectionable to the trade. It must likewise be protected from freezing, which utterly ruins the body of the product.

All dry milk is best kept cold and dry. It is extremely hygroscopic, and on picking up moisture deteriorates rapidly. Although the government permits 5 per cent moisture in dry milk, every manufacturer realizes that this is too high, if his product is to keep. The bulk of dried milk now being made is skim; dried whole milk has its own troubles. It contains over 26 per cent milk fat, which in time readily oxidizes in air to give a marked tallowy flavor, a process catalyzed by sunlight and copper salts. This is avoided by keeping the material away from air and sunlight, and, in the case of package goods, by marketing the product in cans filled with inert gas—nitrogen or carbon dioxide.

The ideal in marketing is, naturally, to supply fresh goods and to have a quick turnover. Since, however, there is a flush of milk in late spring and a shortage in early winter, manufacturing production is not and cannot be even. It is better for quality and reputation for the products to be kept in cool storage at the plant or in a warehouse than to be displayed on a grocer's shelf in the sun or in a hot storeroom at the back of his shop. Under storage conditions such as a manufacturer maintains, these products could when properly made be kept for many months or even years. Fortunately, this is not necessary except in such rare cases as, for instance, the Byrd Antarctic expedition, which is blessed with ideal natural refrigeration.

Sea Food

By Harden F. Taylor

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TO RECOGNIZE the fisheries as rightfully occupying a place among our basic industries, we need only to be reminded that the ocean receives seventy-one per cent of the earth's quota of sunshine available for the photosynthetic production of food; that for millions of years it has been receiving, via rainfall and rivers, the soluble mineral substances of the land and contains throughout its entire extent a uniform and adequate supply of all chemical elements necessary for life; and that fishes, being cold-blooded animals, which do not use up the greater part of their food to keep themselves warm as do birds and mammals, are therefore extremely efficient converters of plant substance into animal food.

Why, then, have the fisheries remained so long a minor and neglected industry? Mainly because of lack of adequate means of preservation. Being an ancient industry it has, following a well-recognized principle, been most deeply embedded in tradition and slowest to grasp the opportunities of scientific research. Now that it has begun to do so, progress is being made at a dizzy rate.

Sea products are peculiarly perishable for several innate reasons: Being buoyed up by the water in which they live, they do not require tough skins, membranes, and ligaments to hold them together and protect them. They are therefore physically delicate and easily damaged by rough treatment, and are much more easily invaded by bacteria than are land animals with impervious hides. Also, fishes are wet and usually covered

with a natural slime that is a favorable sub-stratum for bacterial growth. Coming from the oceans, they are available at first hand only along the margins of the land; if they are to be made available to inland peoples they must be transported, often to great distances and through warm climates. The great popularity of sea foods where they can be had fresh, on the one hand, and the widespread dislike of fish among our inland populations, on the other, sufficiently prove that our means of preservation and distribution have been inadequate.

A comparative study of all known means of preservation of animal foods leads to the conclusion that low temperature is the most nearly ideal preservative we have for fish. The two destructive processes, bacterial decay and autolysis, are both retarded by moderately low temperatures and arrested at lower temperatures, i.e., below freezing. Artificial refrigeration can be applied at will, accurately controlled, and withdrawn when the fish are to be used. Whereas all other methods of preservation seriously alter the characteristics of fresh fish, freezing accomplishes the desired purpose of delivering fish to the consumer just as it was when it came from the water, the processes of decay being arrested meanwhile. The newer research on the preservation of fish has been concerned with means of so freezng fish that objections to freezing are eliminated.

The freezing of fish has, of course, been practiced for many years, by placing the fish in cold rooms to freeze. But we have found that this practice was imperfect for two reasons: the fish were often frozen to avoid loss, and were therefore not always in good condition when frozen, and the slow freezing resulted in great damage to the edible portions of the fish by the formation of ice crystals in the cellular tissues. Research revealed that freezing could be so applied that freezing is accomplished in a few minutes and with substantially no internal crystallization. With perfectly fresh fish and this extremely rapid freezing, great improvement resulted; but certain other adverse changes of a physico-chemical nature were also found to occur. These troublesome changes, resulting in discoloration and a serious loss of tissue-juices when the fish are defrosted, were found to be associated with the physiological chemistry of the living fish-processes which, if not arrested, proceed to run wild after death. These were eventually subdued and, with protection provided by suitable wrapping and packaging materials, a product was obtained which, even after months of storage and transportation, in some cases across the continent, have not only been generally pronounced the equal of strictly fresh fish, but are accepted as such by the public to the extent of millions of pounds per annum.

Incidental to the fundamental problem of preservation is the cutting, freezing, and packaging of the edible part only of the fish, as *fillets,* and the utilization of the remainder for a byproduct fish meal for feeding animals. With refrigerator cars (which are mechanically refrigerated freight cars with low temperatures accurately controlled), refrigerated warehouses in the field, and electric refrigerators in retail food stores, all supplementing a producing fleet of ships and a factory for the technical processes of preparing, quick freezing, and wrapping, there is a complete chain of fish distribution covering the continent. By this means the edible parts of fish can be made available anywhere, in neat, sanitary packages, sold at all food and grocery stores, and protected throughout the several steps of distribution by the best preservative known—artificial refrigeration.

From this the most important generalized conclusions are: If scientific research has shown freezing to be the best preservative for this particular class of foods, it is not only to the producer's interest that this preservative be used but it is to the public interest as well. There is, therefore, no reason or necessity for concealment or camouflage, but rather for offering the product directly to the consumer in the frozen condition as the best guarantee there is of perfect quality.

It seems to the writer highly probable that this general scheme of distribution will be found applicable to certain other perishable foods, once the details of application have been worked out as they have been for fish. In the future we may, very generally, see electrically refrigerated cabinets maintained in retail stores wherein hard frozen perishables will be delivered to the customer who will defrost them in the kitchen, and will be assured that they have not deteriorated in quality since they were frozen at their point of origin.

Cane Sugars, Syrups and Molasses

By Wm. Ludwell Owen

Research Bacteriologist, Louisiana Agricultural Station, Baton Rouge

ONE unversed in the susceptibilities to deterioration of cane-sugar products might assume that to apply the term "preservation" to the products would be almost equivalent to its application to any of our well-known preservatives, such as table salt, vinegar, or other substances used in the preservation of foods. As is generally known, sugar acts as a preservative; when its concentration reaches a certain point micro-organisms are prevented from developing. Upon the validity of this theory the entire confectionary and preserving industries have been successfully established.

The prevalent misconception regarding the preservative action of sugar is the result of a lack of understanding of the principles upon which this action depends. It is not due, as many would believe, to bactericidal action of the sugars upon the micro-organisms whose activities must be restrained. It merely establishes at certain definite concentrations an osmotic pressure which exceeds that to which most species of micro-organisms can accommodate themselves. There is nothing specific about its action; it is merely a means of obtaining this concentration by the use of the purest known human food. When, however, consideration is given to the degree of concentration that must be attained for sugar to act as a preservative, the fact is developed that for the ordinary species of micro-organisms from 20 to 30 per cent would suffice amply, although for those species encountered in sugar manufacture a concentration of 66 per cent is insufficient. Hence a saturated solution of pure cane sugar in water is still susceptible to fermentative changes, and a cane molasses, which contains invert sugar and sucrose in the proportion of two of the former to three of the latter, is not susceptible to fermentation at the densities to which it is normally evaporated in the process of sugar extraction.

The problem of the preservation of refined sugars or of plantation white sugars made by the vegetable carbon process, or by any of the methods of clarification by which sugars are ordinarily made, consists in

the production of a sugar of such purity that it shall contain no hygroscopic substances and is susceptible of being dried to absolute dryness and maintained in that condition under ordinary conditions of humidity. The processes of clarification, char filtration, evaporation, and granulation are all conducive to that end, and every stage of the manufacturing process designed to remove coloring-matter colloids and other impurities serves the equally important purpose of removing micro-organisms and the nutrient material essential for their development. The preservation of refined granulated sugar, however, irrespective of its degree of purity, is a problem of producing an absolutely dry product of such purity that it will not absorb moisture on storage, for even the highest grades of refined sugars, if they become moist through moisture absorption, are susceptible to rapid deterioration by mold fungi.

It may not correctly be assumed that freedom of a granulated sugar from deterioration is the result of a sterile product; almost every sugar, regardless of its source or its purity, will likely contain some living vegetative cells or spores of bacteria or of fungi. To be sure, these are very few in number in the average sugar of this type, although they may be sufficient sometimes to cause trouble to canners of some commodities in which sugars are used where the density of the product and the canning temperatures are not designed to conform to the thermal death point of the very highly resistant spores of the bacteria that normally occur in sugar products.

Although the preservation of refined cane sugars depends upon the maintenance of a condition of absolute dryness in the product, the problem is quite different with raw sugars and with yellow confectioners' crystals used by the confectionery trade. These products cannot be produced in as dry condition as the refined product, and even if so manufactured would be susceptible to moisture absorption and to subsequent deterioration in storage. Here the problem is one of maintaining around the sugar crystal a film of molasses of such density that the development of micro-organisms is prevented. To maintain this condition involves efficient clarification practices; improperly clarified liquors will not crystallize under such conditions of purity as to insure a film of molasses of the required density. If crystals of refined granulated sugars were coated with a film of final molasses (blackstrap), very little, if any, deterioration would occur in these products on storage, whereas if such crystals were treated with a table syrup or with a first molasses, a very bad-keeping sugar would probably be produced, unless special measures were adopted to dry them thoroughly before storage. From this the conclusion is evident that the susceptibility of a sugar to deterioration in storage is determined by its absolute purity and dryness in the case of refined granulated sugars, or to the density of the film of molasses surrounding the crystals in the case or raw or yellow confectioners' sugars. In the latter the susceptibility of the molasses film determines the susceptibility of the crystals themselves to deterioration.

Preservation of cane syrups in the canning industry is relatively simple; compared with some of the other food-preservation industries, it is simplicity itself. Although these products are very susceptible to fermentation by certain types of yeast, which can accommodate themselves to the relatively high density of the syrup, these yeasts have a comparatively low thermal death point as compared with the spores of bacteria. Thus, the processing temperatures required for the preservation of this food product are well within the limits that can be carried without materially altering its composition or impairing its flavor. The low heat conductivity of the product makes it necessary to process the material prior to canning it, and care must be exercised to avoid the excessively prolonged retention of heat by the product within the cans. The thermal death point of the various species of Torulae yeast responsible for the fermentation of canned syrups, and the production of "swells" and "springers," varies over fairly wide limits, so if the infection of the product with the most resistant species, might by some means be excluded, the processing temperature might be reduced by 20 deg. with equally satisfactory results as regards the keeping qualities of the product, and the quality of the finished product would also be greatly enhanced.

The canning of molasses and blends of molasses and commercial glucose is slightly more complicated than the canning of syrups, because these products are more susceptible to chemical changes by prolonged heating and few of them are, or in fact need to be, sterilized in processing. Particularly with the lower grades, the processing temperatures are designed to inactivate rather than to kill all the species of micro-organisms capable of inducing their fermentation. Hence where both syrups and molasses are carried from process pans to canning machines through the same pipe lines, there is considerable danger of contamination of the former by the inactivated yeasts contained in the latter, because the inactivation of the species applies only for the density and the composition of the molasses and not for the syrup. The blending of molasses with corn syrup (commercial glucose) makes it necessary to increase the processing temperature of the blend, even when the density of the blend is the same as that of the original molasses.

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The canner of cane molasses is troubled with another type of deterioration, more annoying and more confusing than that from fermentation and also much more prevalent—namely, "swells," resulting from the "spontaneous decomposition" of the product. This is often confused with the true type of fermentation, and its detection, or identification, is all the more confusing because the products formed are very similar, the gas in both cases being largely CO_2; and living yeast cells may be found in the spontaneous type as well as in the true fermentation. This is so because the temperature of processing is, as has been pointed out, an inactivating

rather than a sterlizing temperature. This type of "swells" represents fully 95 per cent of those occurring in canned low-grade molasses used for baking purposes, and a very large per cent of even first molasses.

Identification of the causes of "swells" of syrups or molasses is complicated by the fact that after the contents of a can has been subjected for any considerable length of time to the pressure of gas developed during decomposition either by fermentation or "spontaneous decomposition," the number of living yeast tends to decrease, until the product may eventually become sterile from an autogenous cause. The age of the product must therefore be taken into consideration before attributing to "spontaneous decomposition" a "swell" or "springer" in which no living yeast cells can be found.

It is quite reasonable to predict that great improvements in the practices of canning of syrups and molasses may come from the better understanding of the thermal death point of the species of yeast responsible for the fermentative changes that these products undergo in storage, and from a clearer insight into the complex chemical changes responsible for the spontaneous combustion of molasses which gives rise to "swells" and "springers" in the canned product of this grade of goods. It is quite within the realms of possibility that sterilization by high pressures, or high-speed centrifugalization, may some day entirely supersede the present method of heat sterilization for table syrups. Preservation practices on these products, however, have improved so rapidly within the last decade that the losses from spoilage in this industry are almost infinitesimal, and since none of the products formed, either in the true fermentative changes or the spontaneous decomposition which these products undergo, are in the least injurious to health, it can be stated without fear of contradiction that there is not, nor has there ever been, a more wholesome human food than that represented by canned table syrups and molasses.

Carbonated Beverages Containing Fruit Juices

By W. D. Bost

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IN CONSIDERING the subject of the preserving of carbonated beverages containing fruit juices, it is necessary first to give some attention to the fundamental causes of spoilage or fermentation in such beverages. It has been my experience that the vast majority of cases of spoilage result from the development of yeast, thereby causing fermentation in the finished product. Frequently yeast fermentation is accompanied by the development of bacteria, but the primary cause of spoilage is believed to be from yeast development. Also the development of mold demands consideration of preventive methods, but this is not nearly so frequent nor serious as the development of other microscopic organisms, resulting directly in spoilage.

It is well known to bacteriologists that microscopic organisms are prevalent in the air, ready to change from the hibernating spore state to one of active germination whenever they are subjected to favorable conditions. From this it is obvious that the important subject of preservation is one of controlling the conditions to which these organisms may be exposed. If conditions that are unfavorable to the germination and development of microscopic organisms are maintained, no trouble with spoilage will occur. Favorable conditions for the development of yeast, and certain other microscopic organisms, include the moisture, oxygen, yeast "food," (inorganic and organic), and the proper temperature. With these conditions all satisfied, microscopic organism development, resulting in fermentation is certain.

In the finished bottled drink water is necessarily present, and this is one of the conditions favorable to yeast development. Sugar, which is an organic yeast "food" must also be used; beverages containing fruit juice contain fruit sugar, an invert sugar that is more readily fermented by yeast than is cane sugar. Thus, in a carbonated beverage, containing fruit juice, two or three factors that are favorable to yeast development are present, but these conditions are also essential factors in the finished product itself and cannot be eliminated. If the water used in bottling the beverage is not distilled it will contain some mineral (inorganic) matter that will also act as a yeast "food." The term yeast "food" includes all products that assist in the development of yeast. It has been found that certain mineral substances have a greater exhilarating effect on microscopic organisms than others. For example, calcium sulphate is an excellent inorganic yeast exhilarant, and the manufacturer of carbonated beverages using water containing this substance will have added to his list of troubles a fourth factor favorable to yeast development, with its possibilities of spoilage.

Among corrective measures perhaps the most important is the elimination of as much as possible of the air and oxygen. The best way to accomplish this is to distill the water; by so doing practically all of the air, which is a primary source of oxygen is removed as is, also, the inorganic yeast "foods." The water is then a pure, neutral medium and in excellent condition to be impregnated with carbon dioxide gas.

The presence of carbon dioxide gas in the water in sufficient quantity brings about a condition that is very unfavorable to the growth of yeast. It not only prevents the development of certain microscopic organisms but, when present in sufficient quantity, will actually destroy them to a considerable degree. All sugar used should be pure, white, granulated, cane sugar and should not be inverted. To prevent fermentation the proper degree of carbonation is approximately three volumes of CO_2. The degree of carbonation should not be allowed to fall below two and three-fourths volumes, if carbon dioxide is to be relied upon as a reasonably safe means of preservation.

The sirup-mixing equipment and all other apparatus coming in contact with the ingredients or finished drink must be maintained in sanitary condition. Bottles used for carbonated beverages should first be sterilized by passing through an alkali solution containing not less than $3\frac{1}{2}$ per cent of caustic soda and at a temperature of not less than 125 deg. F. Bottles should remain in this solution for a length of time sufficient to clean and sterilize them properly. This time is usually fixed by the manufacturers of bottle-cleaning equipment. All traces of alkali should be removed and bottles cooled to room temperature before the beverage is filled into them. After the bottles are filled the crowns should be very tightly attached in order to prevent loss of carbon dioxide gas. If these conditions are all faithfully followed, fermentation or spoilage should not result in the finished beverage.

If a manufacturer is using water that has not been distilled, which does not contain any calcium sulphate and has a total solid content under fifteen grains per gallon, he can operate with reasonable assurance that he will not have any spoilage, if all other conditions are satisfactory; but if calcium sulphate is present in quantities greater than a trace it will be dangerous to proceed without first distilling the water or, at least, removing the calcium sulphate.

Another method by which bottled beverages may be preserved without the use of chemicals is by the use of

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heat. If a bottler wishes to use heat he should install sterilizing equipment that will enable him to subject the finished bottled drinks to such temperatures and for such periods of time that the contents of the bottle will reach a temperature of 195 deg. F. for not less than three minutes. This applies only to beverages containing free acid, such as citric, tartaric, and other fruit acids, as the presence of acid aids in sterilizing and also operates against the development of microscopic organisms. The average bottler or manufacturer of carbonated beverages is not equipped with commercial sterilizing equipment and, furthermore, heating the beverage certainly does not improve its flavor, most likely causing some injury to its general quality. Therefore manufacturers of carbonated beverages prefer to use sanitary methods, which will enable them to operate without the use of chemical preservatives or heat applied as a sterilizing agent to the finished product.

Those interested in bottling fruit-juice carbonated beverages should experiment on a small scale and subject the finished drinks to a constant, continuous temperature of 85 deg. F., for thirty days. If no spoilage develops during that time it may be assumed that the process is satisfactory for bottling carbonated beverages that are to be distributed and consumed locally and that will probably reach the consumer within ninety days or less, after the date of manufacture.

From the foregoing the conclusion is warranted that a bottled carbonated beverage containing fruit juice can be successfully bottled without spoilage if certain fundamental rules governing sanitation are observed and other special conditions complied with, relating particularly to this field of food preservation. It may also be inferred that failure to observe these rules will result in fermentation, not only in drinks which contain fruit juice but in imitation drinks as well.

Fats and Oils Industry

By DAVID WESSON

Technical Director, Southern Cotton Oil Company, New York City

GENERAL principles underlying the preservation of edible fats and oils differ somewhat from those applied to ordinary food products. It is entirely practicable to speak of oils as liquid fats, the only distinction between a fat and an oil being the difference caused by a few degrees of temperature. The word "fats" usually implies materials that are solid at ordinary temperatures; for example, lard and tallow. When heated they become liquid, and there is no visible difference between them and oils, which are fluid at ordinary temperatures. At low temperatures oils become solid, in common parlance they would be called fats. In discussing preservation the application of this principle is of considerable importance, and in this article the word "fats" will be used to describe both solid and fluid glycerides.

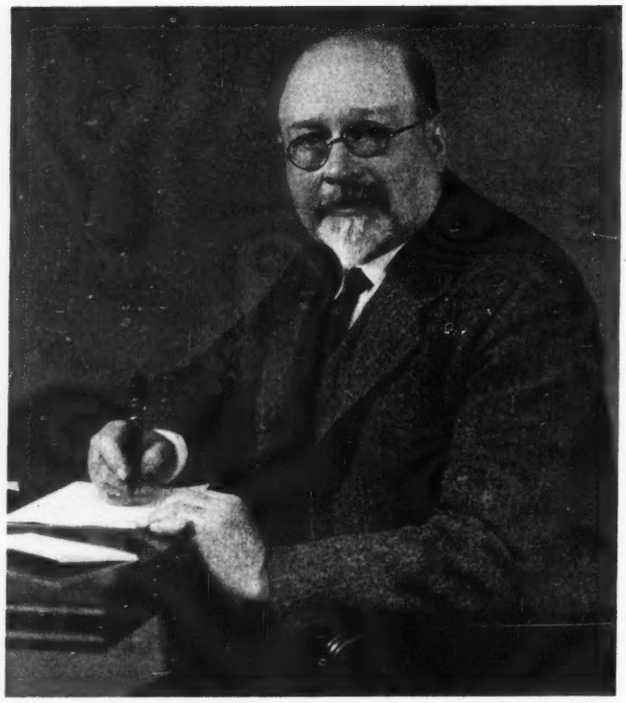
A pure fat, being a glyceride—or rather a mixture of glycerides—and free from organic matter, naturally is not subject to the action of bacteria in the same manner as are most foods. Pure fats are not obtained in the free state in nature. Animal fats are always found associated with the nitrogenous matter of the tissues, and the same is true of those of vegetable origin. In the preparation of edible fats it is of the utmost importance that they be separated at the earliest possible moment from the surrounding tissues in which they exist, because these tissues are readily acted upon by bacteria and other micro-organisms and enzymes, which, acting as hydrolytic agents, break down the fat molecules.

Fats, when subjected to high temperatures, are liable to more or less decomposition, depending upon the conditions. For instance, if fats are heated, in the presence of water and under pressure, they are broken down into fatty acids and glycerin, several processes of the manufacture of glycerin being based upon this principle. In rendering lard and tallow, even though fresh material be put into the rendering tanks hydrolytic action will result, the products often showing the presence of free fatty acid in amounts as high as 1 per cent or over.

Recent investigations have shown that the presence of small quantities of free oleic acid will stop decomposition in fats, the oleic acid acting as a catalyzer. For this reason, and other things being equal, the lower the amount of free acidity in fat, the better will be its keeping qualities. As already stated, the contact of the fat with the animal or vegetable tissues will start the formation of free fatty acid; therefore one of the first steps in the preparation of an edible fat is to remove the free fatty acid and all bodies of fermentable or putrefactive nature derived from the tissue. This is the method ordinarily employed in the refining of cottonseed and other vegetable oils.

After alkali treatment, fats are frequently subjected to filtration and deodorization by steam. In the application of these processes, it is of the greatest importance that the fat should not be in contact with the air at high temperatures, the absorption of oxygen giving rise to the formation of various bodies of unpleasant taste and odor.

All fats are acted upon strongly by sunlight, which apparently changes some of the unsaponifiable constituents in such manner as to cause a very marked flavor. It has been noticed, also, that fats subjected to sunlight for a long time, especially in contact with air, will acquire an



David Wesson

increased density and viscosity. High temperatures are conducive to spoilage of fats, and the converse is true in reference to low temperatures. Fats kept at low temperatures—namely, below the freezing point of water—will keep sound and sweet indefinitely.

The addition of various substances to fats to improve their keeping qualities has been tried at different times, and various patents have been taken out therefor. Gum benzoin was used at one time in France, and the French navy formerly had a formula by which onions, garlic, and other vegetables were incorporated in lard that was to be carried on long cruises. In all probability, the essential oils of the garlic and onions covered up the natural damage, which in the process of time the fats underwent.

To sum up, the best way to preserve fats is to prepare them, with proper precautions, from the freshest materials obtainable, then remove all traces of materials not fat, which may have been derived from the materials from which they are prepared. When this is done, the resultant fats are best preserved by keeping in an absolutely dry condition, free from the influence of the air, light, and moisture, and at as low a temperature as possible.

The vegetable-oil industry is largely a seasonal one. Oil is produced generally during a period of six months and has to be carried for the remainder of the year, and sometimes for considerably longer periods. Experience has shown that it is best kept in large storage tanks, of as much as ten thousand barrels or more capacity. In the storing of oils in large tanks the principles already mentioned hold true. Where oil is to be kept for a long time it is good practice to cool it before putting it into the storage tanks. Very few plants, however, are equipped for doing this. In practice, after a relatively large amount of oil has been placed in the tank and cooled off, subsequent additions of warm oil are cooled by the large mass already in the tank.

Where the oil in large tanks is frequently being added to and withdrawn, measures should be taken to prevent the drawing in of moist, outside air. This will result in condensation of moisture on the walls of the tank, the accumulation of moisture forming an emulsion and invariably resulting in a bottom layer of oil of inferior flavor. Various means have been proposed and used for overcoming this difficulty. One obvious method is that of allowing all air entering a storage plant to pass over chilled coils, which will condense atmospheric moisture. Another method is to have the tanks covered by a roof, the eaves of which are open on all sides, so that there can be do difference between the air above the oil and the surrounding atmosphere.

The preservation of finished fats in cans or packages sent to the consumer is governed by the foregoing well-known principles. The fats when packed must be pure and free from moisture and should be hermetically sealed. Put up in this way, fats will keep for years.

Needless to say, great care and watchfulness should be exercised in every step of the preparation of edible fats. Cleanliness of apparatus, proper temperatures, absence of moisture, and exposure to light and air must be carefully looked after. The price of sweet, sound fats delivered to the consumer is the same as that of liberty, namely: "Eternal Vigilance."

Fiber Containers and Food Preservation

By J. D. MALCOLMSON

Package Engineer,
Robert Gair Company, New York

FIBER CONTAINERS are usually looked upon as *shipping* containers only. Actually, they are fulfilling an increasing and very important mission as food preservers. The general term "fiber containers" is here considered to include the new and important "cracker caddy" as well as the better-known corrugated and solid-fiber shipping cases. Some of the more important fields in the realm of food preserving which have been successfully entered by these containers include:

Fresh fish (frozen)
Refrigeration by the "Dry-Ice" process
Biscuits and crackers
Fresh fruit and vegetables
Butter and oleomargarine

Perhaps the two outstanding characteristics of most of these containers, which have contributed much to their success in the food-preserving industry, are the high insulating value of corrugated board and the exceptional moisture- and grease-resisting qualities of caddy board. Insulation is extremely important in the shipping of frozen foods such as fresh fish and of the fast-growing list of products now being packed in conjunction with "Dry-Ice." Moisture-proofing and grease-proofing are equally important in the shipment of bakers' products, as well as of many other commodities susceptible to changes in moisture content.

The most efficient insulation medium known is dead air. Analysis of any of the important thermal insulators will establish the fact that their value depends upon the more or less minute cells of dead air that have been trapped in the structure of the insulating medium. A similar examination shows that the flutes of double-faced corrugated board also consist essentially of dead air

cells, and the sealing off of these cells is accomplished by the folded flap creases at the top and bottom of the box. The American Society of Heating and Ventilating Engineers (*Journal,* Vol. 26, No. 7, October, 1920, p. 647) has shown that corrugated board stands high in the scale of efficient insulators, ranking higher than 85 per cent magnesia. This valuable property can be augmented to almost any extent by the addition of one or more layers of corrugated pads and liners.

The effects of the use of corrugated board was studied in our laboratories not long ago by sealing a known weight of ice in pans in corrugated boxes of various styles of construction. These boxes were then held in a room having a temperature of 50 to 55 deg. F. for 13½ hours. At the end of that time the boxes were opened and the amount of ice melted was determined by weighing the remaining ice. The results follow:

Box	Amount Ice Melted, Per Cent	Wall Thickness, Inches
Corrugated (double)	50.00	0.3125
Corrugated (triple)	45.31	0.4375
Corrugated (quadruple)	31.25	0.5625

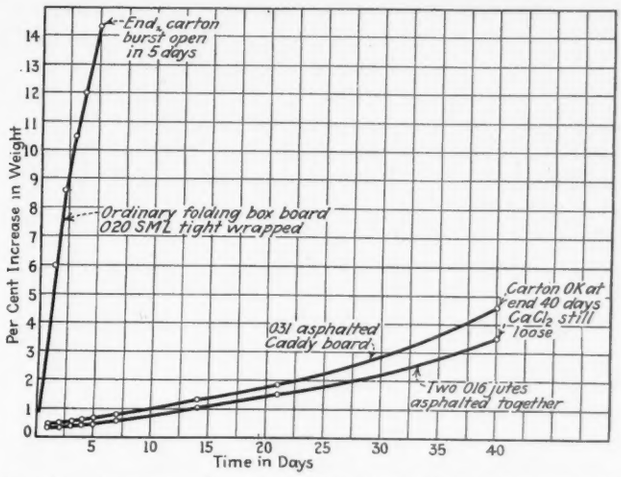
Incidentally, balsa wood, which is famous for its insulating properties, showed a loss of 35.16 per cent under the same treatment. This wood, however, was 1 in. thick; in consequence, these results when calculated back to a common thickness denominator indicate that 0.625 in. of corrugated board have an insulating value equivalent to 1 in. of balsa wood.

The results of these researches are rapidly finding practical applications in industry. For instance, precooled fresh fish is now being shipped by express and parcel post in corrugated boxes, without icing or external refrigeration. One of the secrets of the modern, precooled fish industry is extremely rapid freezing, which keeps the cells of the flesh intact. The slower methods of the recent past permitted the formation of relatively large ice crystals that ruptured these cells and thus spoiled the flavor. By the modern method the minute crystals cause no damage and the flavor is the same as with fresh fish, even after long periods of time, provided the fish stays frozen in the interim. It is the function of the corrugated box to guard this low temperature during transit. In a recent address by F. W. Bryce, president of the Atlantic Coast Fisheries Corporation, he stated: "We studied the type of package and determined upon the corrugated container in place of the wooden box. The reason therefor is quite obvious, for the corrugated container can be sealed and made approximately airtight."

Flavor is also injured by loss of moisture from the frozen fish. This is safeguarded by the use of a layer of asphalt in one of the facings of the corrugated box. The valuable properties of asphalt are discussed in more detail below.

"Dry-Ice" is one of the miracles of today's American inventiveness. As most people know, this is simply frozen carbon dioxide gas, having a temperature of 14 deg. below zero. It also possesses the remarkable property of passing directly from the solid to the gaseous phase, skipping the liquid phase entirely. Here is a marvelous refrigerant, therefore, combining very low temperatures with exceptional cleanliness, to say nothing of its well-known preservative qualities from a chemical standpoint. "Dry-Ice" is, of course, more expensive than is ordinary ice, but its valuable properties have already assured its successful use, as is evidenced by the rapidly growing list of industries that are using it. Chief among these are perishable luxuries such as ice cream, Eskimo Pie, and others of like nature, but other fields, such as fresh meats and other packers' products, are conducting intensive experiments with it. Here again, corrugated shipping cases and specially designed folding boxes have been found to be the logical containers.

Insulation, however, does not always apply to heat and cold. In food preservation it is often fully as important to prevent the passage of moisture and grease. Soda crackers, for instance, begin to lose their crispness with even the slightest absorption of moisture. Conversely, marshmallows harden very quickly if allowed to dry. These, and similar, goods are manufactured under the very nicest of atmospheric balance, and the maker must demand a package that will deliver his goods in just the



Graphic demonstration of results obtained in a test of the comparative worth of ordinary folding box board carton and of container material made up with asphalt.

right condition as regards moisture content. Long and painstaking research has shown that refined, odorless asphalt is the best commercial medium for preventing the passage of moisture in either direction.

Similar work has developed modern glassine paper, which has the power of resisting grease penetration to a remarkable extent. This is important in the packaging of biscuits and bakery products containing a high percentage of shortening (short bread) or cocoa butter (sugar wafers). The practical answer was the development of "cracker caddy board," having an inner liner of glassine paper and a buried layer of asphalt, the latter so applied that no pinholes or other leaks are possible. Originally developed for the biscuit and cracker industry, this caddy board was rapidly adopted for such products as bulk candy, ham and bacon, pretzels, cheese, nuts, and cigars.

Besides insulation, food preservation is aided by prevention of bruising. This is especially true of fresh fruit and vegetables, although the insulation of pre-cooled fruits is also a factor. The cushioned walls of corrugated board are valuable here, and a large and increasing tonnage of apples, citrus fruits, and vegetables is now moving in these containers.

The foregoing are but a few examples of improved food preservation methods that can be credited to fiber containers. Beyond question, however, the surface has only been scratched. Intensive research by box makers is rapidly bringing forth new types of containers and new uses for them in the field of food preservation.

SALT *for* Preserving Refrigerating

SALT was unattainable to primitive man in many regions, and even today it is still a luxury in some parts of the world. Wars were waged years ago for control of saline streams by the Germans, who believed that salt in the soil invested a district with peculiar sanctity and made it a place where prayers were most readily heard. Some of the world's oldest trade routes were established for traffic in salt; one of the ancient roads in Italy is still known as the Via Salaria. Cakes of salt have been used as money in several parts of the world, particularly in Abyssinia and Tibet.

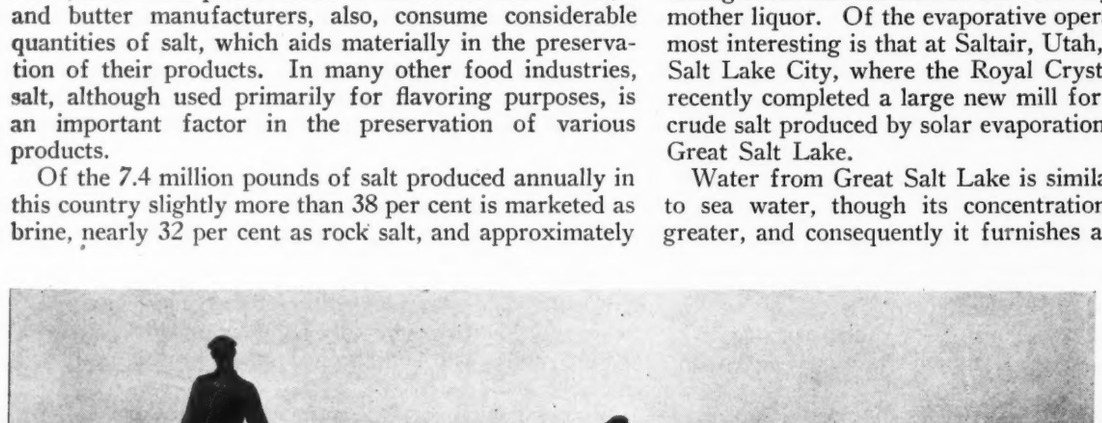
Operations of Royal Crystal Salt Company at Saltair, Utah . . . Solar evaporation of Salt Lake brine . . . Analyses of product . . . Applications in the food industries.

By H. D. KEISER

OF THE many and varied uses of salt, one of the most important, aside from its culinary application, is as a preservative. Common salt—sodium chloride—is found abundantly in nature. The manufactured product is extensively employed in the curing of hides, and in the preservation of meats and fish. Cheese and butter manufacturers, also, consume considerable quantities of salt, which aids materially in the preservation of their products. In many other food industries, salt, although used primarily for flavoring purposes, is an important factor in the preservation of various products.

Of the 7.4 million pounds of salt produced annually in this country slightly more than 38 per cent is marketed as brine, nearly 32 per cent as rock salt, and approximately 30 per cent is evaporated to crystalline form—in the main by artificial heat. Solar evaporation is, naturally, confined to the arid regions adjacent to Great Salt Lake and to California. In 1925 the principal producing regions were: Michigan, 30.5 per cent; New York, 27 per cent; Ohio, 12.4 per cent; Kansas, 9.9 per cent; Louisiana, 9.2 per cent; with California, West Virginia, Utah, Texas, and New Mexico jointly contributing 11 per cent. It is obvious that solar evaporation, although the most ancient of methods and still of major importance on the Mediterranean littoral, is by no means the predominating American method of the recovery of salt from its mother liquor. Of the evaporative operations, one of the most interesting is that at Saltair, Utah, 11 miles west of Salt Lake City, where the Royal Crystal Salt Company recently completed a large new mill for the treatment of crude salt produced by solar evaporation of the waters of Great Salt Lake.

Water from Great Salt Lake is similar in composition to sea water, though its concentration is seven times greater, and consequently it furnishes an excellent brine



Fordson tractor pulling a special scraper designed and built by the company

Forming the stockpile by means of a portable conveyor

ng*and* Flavoring

for salt making. At the plant of the Royal Crystal Salt Company this brine is pumped from the lake into a flume, from which it is discharged into a series of ponds for concentration and crystallization. These ponds are of two types—namely, settling or concentrating ponds, and harvesting or crystallizing ponds. The former comprise four ponds of 250 acres each, and the latter twenty ponds of ten acres each. Clay embankments 2 ft. wide and 22 in. high, held in place by boards set on edge, separate the ponds. Pumping from the lake begins in April and continues until the middle of September, except during storms. The rate of evaporation is proportional to the rate of pumping, which is about 5,000 gal. a minute for 24 hours a day from the middle of June to the middle of September, the season of greatest dryness, and hence of maximum evaporation.

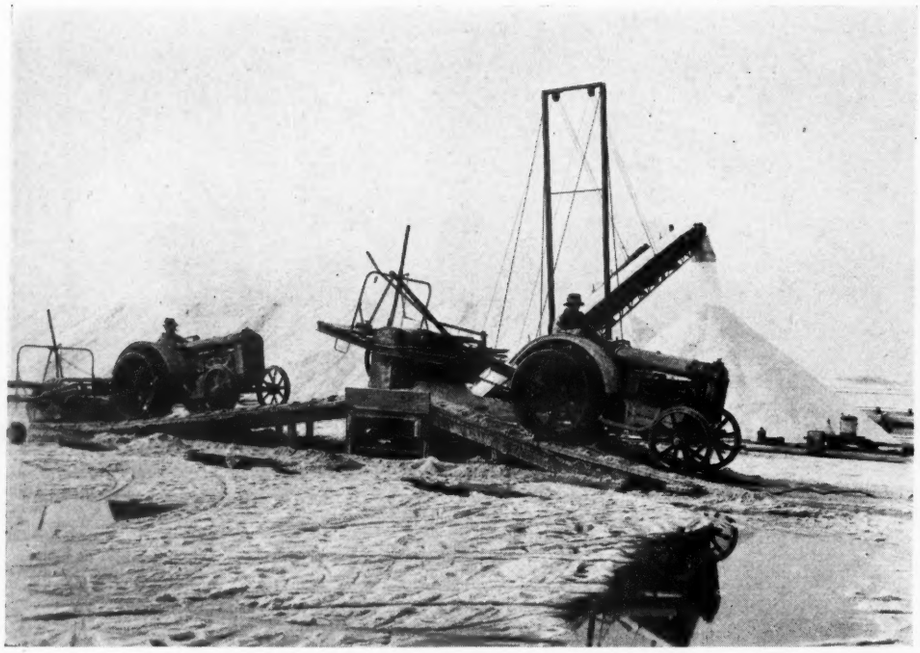
Brine from the lake goes first to the settling ponds, in which it is allowed to remain about 30 days, or until concentration reaches complete saturation, and salt is ready to deposit. The brine is then permitted to flow by gravity through small gates to the harvest ponds. Flow through the harvest ponds is continuous during the entire season, and is regulated to maintain the density of the brine just at the point of precipitation of the salt. All the impurities in the brine—that is, other chemical constituents besides salt, such as magnesium salts and sodium sulphate—prevail below their saturation points at this density, and are, therefore, removed in the overflow, or "bittern," from the harvest ponds. Only pure salt is, consequently, precipitated in these ponds. Care must be exercised, however, to draw off the bittern before cold weather, in order to avoid crystallization of sodium sulphate, which takes place when the solution reaches a temperature of about 35 deg. F. The bittern is discharged to waste.

A permanent salt floor is maintained in each harvest pond. This floor, which is 12 to 15 in. thick and is not removed with the annual crop of salt, consists of salt precipitated during several years before any harvesting is begun. The crop is separated from the permanent floor by a line of demarcation known as the "split," and is harvested down to this line without disturbing the permanent salt floor.

When the salt is ready to be lifted, ordinary plows drawn by tractors are used to separate it from the permanent floor. It is then stacked by means of tractor-drawn scrapers and conveyors in large piles beside the private railroad sidings along the harvest ponds. From the stockpiles the salt is conveyed in standard railroad cars to the company's near-by mill, where the salt is prepared for the market. Part of the crop is sold from the stockpile without further treatment; this salt is used for industrial purposes. The average annual crop taken from the harvest ponds is 4 in. in thickness, but in some years, when a long, dry summer has prevailed, a 6-in. crop has been obtained.

At the mill, the capacity of which is 50,000 tons a season, the salt from the stockpiles along the harvest ponds is first placed in a large receiving bin above the drier house. From this bin the salt passes to a revolving drier of the kiln type, and then into a cooler of the same type. On leaving the cooler the salt is elevated to a stock bin, from which it is fed to various sets of rolls and screens for crushing and sizing. Products from the screens are of nine different sizes, and each size passes to a separate bin. Under each bin is automatic sacking and packaging equipment that is used in placing the salt in marketable form. The various grades of salt prepared at the plant, and the major purposes for which each is used, follow. The different grades appear in order of size, beginning with the coarsest:

Kiln-dried stock salt, used for cattle feed and in curing hides; extra coarse, used for curing hides; coarse, used in making ice cream, for water-softening purposes, and as a stock feed; special stock, used for sheep feed and in metal-smelting operations, hay salt, for curing hay and as a stock feed; No. 2 meat, for curing meats, curing small hides, and in pickle making; No. 1 meat, for curing meats and pickles; cheese and table salt, used in the cheese-making industry, bakeries, and individual



Dumping the harvested salt into a bin delivering to a portable conveyor

homes; butter salt, for use in the butter industry; and flour salt, which is used by bakeries and in some chemical industries. Moisture-free potassium iodide, at the ratio of one part of iodide to 5,000 parts of salt, is added in a dry mixer to a portion of the table salt to produce iodized salt. Flour salt is used in several food industries, and is also compressed by means of a press into blocks weighing 50 lb. each, for use as "cattle lick."

Throughout the entire cycle of human history salt has exercised a potent influence. Man may live without gold, silver, copper, or coal, but not, healthfully, without salt. Its value is appreciated even by the beasts of the field. Civilization, as it exists today is not conceivable without an abundant supply of common salt.

Doctors Resent Dietary Propaganda

In the opinion of Morris Fishbein, M. D., Editor of the *Journal of the American Medical Association* as enunciated in its pages recently, the advertising writers of our progressive land have found that the word "IT" in their profession means "Health Appeal." A cursory inspection of current periodicals indicates no lessening of the attention to the health angle. The folly of the all-or-nothing policy in foods, the ridiculousness of some of the arguments as to vitamin content, the preposterous claims for glorified antiseptics, the cautious venturings of time-tried tonics into the public field, and the dazzling claims of the promoters of light arouse the risibilities of the physician by their startling inconsistencies if not by their exaggerations. Most startling of all the appeals are those having to do with body-weight. The inevitable result of the present-day serious dieting was to lower the consumption of flour, sugar and other carbohydrates so greatly that persons engaged in those industries became alarmed. Today the millers, the sugar institute, the confectioners, and the manufacturers of cereals are purchasing advertising space to counteract what was for them commercially a serious situation, and what promised to be from the health angle a dangerous situation. Such institutional advertising as is being used by these industries is submitted, before release, to medical authority, and some effort is being made to keep the advertising matter within reasonable bounds. At the same time the manufacturers of Lucky Strike cigarets, having secured, they claim, statements from 20,679 physicians that Lucky Strikes were less irritating than other cigarets, are promulgating a campaign in which they assert that these cigarets do not cut the wind or impair the physical condition, and that "Lucky Strike satisfies the longing for things that make you fat without interfering with a normal appetite for healthful foods." To which the simple reply is made: "Hooey"!

Some women do eat too much; overweight can be controlled by proper dieting, no doubt in the majority of cases. Many people eat too much sugar and gorge on pastry! But the human appetite is a delicate mechanism and the attempt to urge that it be aborted or destroyed by the regular use of tobacco is essentially vicious. The advertising director of the American Tobacco Company cites among five reasons for the growth of his industry "increasing interest on the part of the medical profession in the social phenomenon of more widespread smoking, and the adoption of a more liberal attitude toward the cigarette and its effect upon the human body in the light of these improvements." That the medical attitude become more liberal toward the smoking of cigarets cannot be gainsaid. There is, however, one aphorism in medicine that is as old as the science itself: "Moderation in all things." Unwarranted, exaggerated, unscientific and dangerous advertising campaigns are not the way to encourage a liberal attitude.

Photo by Ewing Galloway

Fortunately, research has failed to find a substitute for the pretty girl

CO-OPERATIVE RESEARCH Solves Important Problems of the CANNING INDUSTRY

By Laurence V. Burton
Assistant Editor

FEW INDUSTRIES other than canning create their own raw materials. Although it is true that such industries as steel and zinc own mines from which they remove their raw material, they do not create the iron or zinc. In canning and preserving, however, many of the outstanding commercial successes are corporations which own or control large tracts of land and raise their own raw materials.

Whether the individual canner is also a producer, or merely a procurer of raw materials, he is seldom independent of agricultural activities, and his successes and failures are so intimately associated with agriculture that it is impossible to consider the influence of research on the canning industry without a simultaneous consideration of a host of related agricultural problems. That branch of the canning industry that deals with the preservation of both fresh and salt-water fish and other sea foods is likewise concerned with biological problems which are the equivalent of the agricultural problems of the canner of fruits, vegetables, milk, and meats.

Canning is no longer an infant industry. Its discoverer, Nicholas Appert, could not have visualized the developments that were to take place in the century that has elapsed since his time, nor could he have dreamed of the vast amount of scientific knowledge that has developed around the art. But when one reviews the scientific and technical development of canning the most important work of the inventors and builders of canning machinery must not be overlooked. Their activity produced tangible things—machines: machines whose work resulted in something usually intangible, of which the symbol of lowered costs or more rapid production are their only evidence in the finished product. Their contribution to the success of the industry is seldom recorded in the literature of canning, and their success or failure is most often measured in the money that they made or did not make.

In curious contrast is the contribution of the scientists who have labored on the problems of the industry. Their efforts have resulted in valuable although intangible knowledge, but, on the contrary, the results of their work have often been quite tangible. The efforts of science have more often been evident in improvement of product than in the effects on cost and production.

Mechanical Development Has Made the Industry a Commercial Possibility

Seldom has the canning industry, itself, engaged the services of inventors of mechanical equipment. This has been done largely by the manufacturers of mechanical equipment, and their activity has been more or less a speculative one. That they succeeded is proved by the

large variety of well-designed machinery that is today available in every canning factory. The most important development of that industry is to be found in the inventions which have rendered mechanically possible the high speed production of canned foods on a large scale. Without this development, accompanied by the parallel

Photo by Blank-Stoller, Inc.

H. W. Phelps

improvement of can-making machinery, the canning industry would never be even an approximation of its present-day success.

Unquestionably the most important and outstanding feature of the whole canning industry is the tin can. It is impossible to state today who made the first tin can, although canners are still alive who can recall the days when tin cans were made by hand in a canning factory. The canning industry did not develop rapidly until the invention of the first automatic can-making machinery insured cheap tin cans accurately made and tightly constructed.

One of the greatest achievements of all time with reference to the manufacture of tin cans was that made by Charles M. Ams when he invented the so-called sanitary can. The invention of this type of can has been also attributed to Karges, of Germany. The transition from the old-style hole-and-cap can to the open-top can was a most important one, because it not only permitted canners to have the full open top of the can for the insertion of the products to be so packed, but also was a simpler and cheaper can to make; a cheaper can to use in the factory because of the smaller and more economical equipment used to put on the covers, and in addition, it was a can that was much more easily handled mechanically.

Development of the tin can as a container for foods continues along slightly different lines today. The container seems to have been developed nearly to its maximum capabilities, and attention is now being turned to some of the refinements, such as new methods of opening the can. One need only review the current patents to observe the large number granted to cover new methods of making key-opening cans, or cans with special collars affixed to the interior in such a way that after opening they automatically become slip-cover cans.

Further mechanical research by can manufacturers seems to deal largely with the methods of closing the cans, and has brought out various new types of closing machines. These machines have advanced from the single unit, or single spindle, closing type, working at rather slow speeds, to the present-day four-spindle machine with a capacity of 130 or 140 cans per minute. A late development is the automatic high speed vacuum closing machine that, with but a single spindle, operates at the phenomenal speed of 120 cans per minute, moving so rapidly that its bearings are water-cooled to prevent their overheating. The natural sequence of this development has been the dry-vacuum method of canning also called "geralizing." Other researches pertaining to tin cans involve the use of the various types of interior enamels that are to be discussed under another head.

Science Has Made Canning a Success

Scientific research pertains largely to the art of canning, itself. Its historian, however, is faced with two conflicting and difficult tasks, for he may either write a historical summary of all of the published facts and opinions that may be obtained from various sources; or, on the other hand, he may go back of these sources and try to get at the real trends of the times and the forces which influenced and brought about the results that culminated in the published form. Many of the published papers pertaining to the technology and science of the canning industry are the climax of a long series of work, and to credit the final author with all of the developments discussed in his papers may be to overlook part of the earlier pioneer work on which it has been based. One who confines his historical sources only to the scientific papers without an attempt to get at the movement behind the scenes will present a picture somewhat different from the one by him who attempts to cover all of the facts as far as they are known. When Dean Russell, of the University of Wisconsin Agricultural Experiment Station, published, in 1895, a paper on

Photo by Blank-Stoller, Inc.

Geo. W. Cobb

the bacterial spoilage of canned peas, his paper was an important contribution to knowledge, but one should remember the work of Pasteur, who had showed almost forty years previously that bacterial spoilage in wines and vinegars could be avoided by heating. Some of earlier papers that have been published on canning may be described as pointing out the explanation of current phenomena in terms of latest knowledge. Fundamental research was yet to appear.

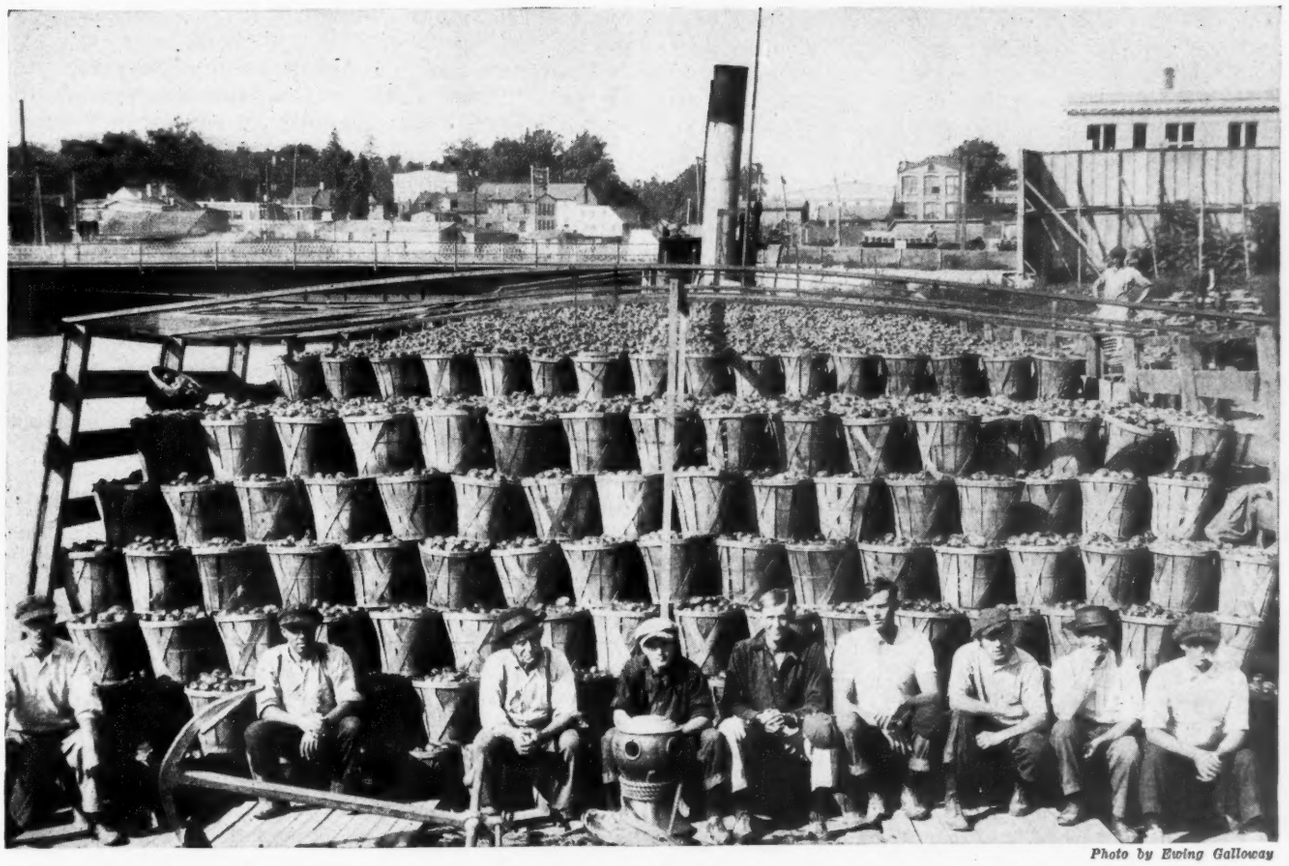


Photo by Ewing Galloway

The basket is growing in favor for shipping soft fruits to the canning factory, for it prevents the bruising and mashing that starts spoilage of raw material

The Forces That Stimulated Research

Dr. Harvey W. Wiley, of the U. S. Department of Agriculture, is responsible for Food Inspection Decision No. 126, promulgated by the Secretary of Agriculture on Sept. 30, 1910, in which the rule was laid down that canned foods may not contain more than 300 mg. of tin per kg. The result of this decision was that canners, for the first time, were compelled to look at their own products with a scientific eye, and it has been said that Wiley and F.I.D.-126 were the forces which necessitated the first fundamental researches in the canning industry, for only then did canners realize that their products might have an effect upon the containers which held them and they then realized that chemistry entered into their production problems. From the investigation as to the reasons for the appearance of salts of tin in canned foods began the studies regarding the whole matter of corrosion of the container, which ultimately led to the tremendous researches later carried out by the National Canners Association, published in 1917, entitled "Relative Value of Different Weights of Tin Coating on Canned Food Containers."

The research was carried out by a committee composed of representatives of the National Canners Association, the American Sheet & Tin Plate Company, and the American Can Company. The 1917 report, comprising 666 pages, outlines probably the first fundamental research that was carried out on canning, and a very large number of present-day investigations, as well as the many scientific papers presented between 1917 and the present, have to do with problems which have developed as byproducts of this monumental investigation.

A second publication on this problem, entitled "Canned Food Containers," was Bulletin 22-L of the National Canners Association, published in 1923, and which was a continuation of the work published in 1917. In Bulletin 22-L is found a very condensed summary of the 1917 report.

The question arises as to why such a tremendous investigation was started and carried through at a cost of over a quarter of a million dollars. It was carried out to settle differences of opinion between canners and can makers and tin-plate manufacturers as to just what weight of tin and what character of base plate should be used to carry canned foods satisfactorily.

Mr. F. E. Gorrell, Secretary of the National Canners Association, once stated that Mr. H. W. Phelps, president of the American Can Company, and Mr. George W. Cobb, general manager of sales of that company, are the fathers of research in the canning industry in the present day. It is due to their vision and logical reasoning that the canning industry is in a better position with respect to the fundamental knowledge of the science underlying its activities than are many other industries.

The earliest scientific papers published pertaining to the science of canning are those by Dean Russell in 1895, and by Prescott and Underwood, of Massachusetts Institute of Technology, in 1897 and 1898, who pointed out the relationship existing between the processes and the bacterial spoilage of canned foods. The problems of the industry at the close of the eighteenth and beginning of the nineteenth century were many, but their solution was not forthcoming. One of the earliest to recognize the need of solution of the many pressing problems was the late E. W. Duckwall, who founded a laboratory in his home at Aspinwall, Pa. He called it "The National

Canners Laboratory," and developed a consulting business that undoubtedly helped many canners out of their troubles, although scientific knowledge was quite deficient in his day. It is interesting to observe that the first scientific help came to the industry from outside sources, for Duckwall and his laboratory were once a part of the organization of the old Sprague Canning Machine Company, whose far-sighted manager, Daniel G. Trench, sensed the need of help for his customers. Dependence upon a single individual, with more or less limited facilities, however, was only toying with a very serious problem.

In those days the problems of spoilage were uppermost, and the usual contention of canners who experienced trouble was to blame the can as the source of that difficulty. Can manufacturers undoubtedly had their own troubles in producing perfect containers, but that was not the solution of the problem. The real trouble lay in the lack of knowledge of the scientific principles underlying canning. The American Can Company established its first laboratory at Baltimore in 1907, and began to study canners' problems as well as the company's own problems as a feature of service to customers, a practice that has since become highly developed by the principal can-making corporations. Problems of bacterial spoilage are largely canners' problems, whereas problems of corrosion of the container are both canners' and can makers' problems, and must be kept in mind as distinctly separate types. The gift of the research laboratory and its equipment to the National Canners Association by the American Can Company and the Continental Can Company, was prompted by the efforts of the can companies to obtain an impartial and accurate solution of the major problems that required a co-operative endeavor in which the several industries involved could be easily represented. The laboratory was started on April 1, 1913, directed by Dr. W. D. Bigelow, and on the initial staff were Dr. F. F. Fitzgerald, Dr. A. W. Bitting and his wife, Mrs. Kate G. Bitting.

To Bronson Barlow is due the credit of first discovering, in 1912, the cause of a considerable spoilage of canned corn, and the studies of the relation of thermophilic bacteria to spoilage of canned foods dates from his work. Barlow, then at the University of Illinois, did his work at the Gibson Canning Company, Gibson City, Ill. Thermophilic bacteria were, of course, known prior to this date, but had not been recognized as possessing any economic importance. In the same year H. A. Baker then chief chemist, but now district sales manager of the American Can Company, reported on the disappearance of oxygen in canned food containers. In the year that followed, Rosenau, Cheyney, Weinzirl, Obst, and others announced the results of studies on various problems, but it was not until the war closed and research again resumed its peace-time activity that fundamental results began to appear.

The rate of penetration of heat into filled cans had been studied first, by Bitting with thermometers sealed in the cans, without entirely satisfactory results, but later, when electric thermocouples were used, more accurate data were obtained and published in 1920 in a joint paper by Bigelow, Bohart, Richardson, and Ball. Simultaneous studies that had extended over several years had been made on the thermal death-time of bacteria and published in 1920 by Bigelow and Esty. Also at this time the U. S. Department of Agriculture became interested and contributed to knowledge of the fundamentals of canning science by the work of Magoon and Culpepper, which is a continuation of the earlier studies by Bitting.

Canning, in one sense, is applied bacteriology, for its success depends on killing the bacteria in the foodstuff after it has been inclosed in an hermetically sealed container, so that, after it has been sterilized, no reinfection can occur. But the sterilization agent is heat—the

Photo by Ewing Galloway

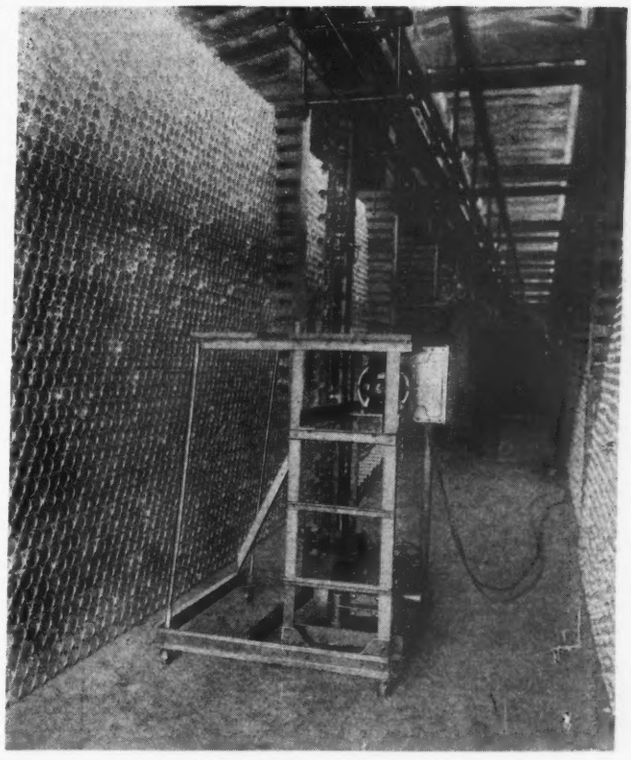
The roller conveyor, developed by E. Pritchard, of Bridgeton, N. J., constantly turns the tomatoes while they pass the inspectors

cheapest sterilizing agent known—and the laws of heat transfer are physico-chemical, whereas the results to be attained by the use of heat are largely bacteriological. Clearly, the problems here needed the services of the two sorts of scientists—bacteriologist and chemists—and of the former a special type of training was required. The science of canning could not be learned until the science of bacteriology had been developed. By the co-operative studies of the chemists and the bacteriologists a great deal was learned, but not until a mathematician, in the person of Dr. C. O. Ball, had worked over the figures, was their true significance comprehended.

It is important to note how much canning owes to physical chemistry, bacterial physiology, and mathematics, and very significant is the fact that as quickly as these fundamental laws of death of bacteria became understood many more contributions to the science of canning were forthcoming. To more than mention the names of a few of the contributors would occupy more space than can be permitted. Donk, Hunter, Thompson, Bigelow, Esty, Cathcart, Ball, Bohart, Kohman, Richardson, Magoon, Culpepper, Stevenson, Tanner, and Cruess will always be remembered for their work in developing the fundamental understanding of what takes place when a can of food is sterilized. All of these men were employed by the National Canners Association except Tanner at Illinois, Magoon and Culpepper in the Department of Agriculture, and Cruess at California, and it is not amiss to point out that the association's committee on scientific research deserves much credit for authorizing the continuance of this work.

At this point it is well to raise the question as to what good purpose is served by all this fundamental information, gathered by years of work, and at a very considerable expense. How can the industry capitalize this scientific knowledge? Today it is possible for a canner to *know* what is a "safe process" for his product instead of guessing at it. Those whose experience dates back more than twenty years will recall the heavy losses encountered where the canner had guessed wrong.

In 1920-22 spinach canners were faced by a regulation that required a definite weight of contents, in each of the several sizes of cans, after the contents were removed and the liquid was drained off. Compliance with the regulation required that cans be packed so tightly that the heat penetration was seriously slowed down. The fundamental science of canning was not well enough understood by the governmental authorities at that time to prevent the promulgation of so unsound a regulation. The results of this seemingly harmless regulation constitute an unhappy chapter of the industry. Research necessary to cause a repeal of the regulation was already in existence, but selling the ideas to those concerned required an amount of time that, in view of past events, was far too long.



An important mechanical development is bulk storage of filled cans with an over-head cable conveyor to carry the cans to and from the warehouse

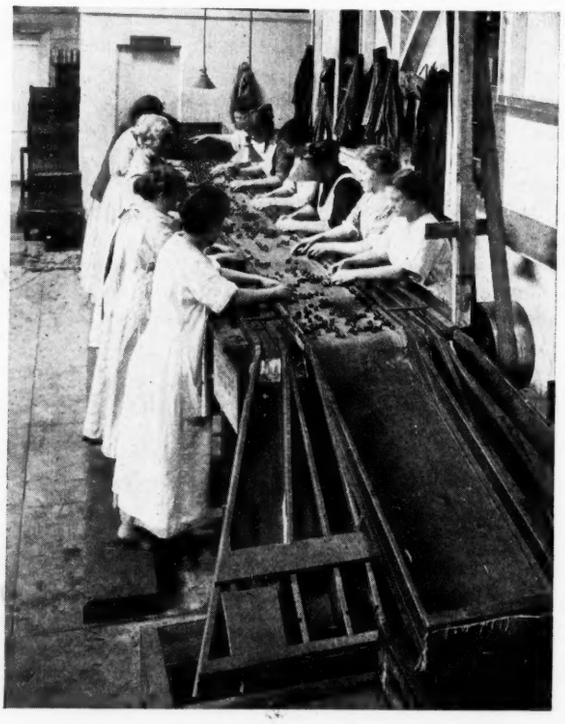
(To be concluded in the February issue.)

Photo by Ewing Galloway

An adaptation of agricultural machinery to canning—the sickle-bar from a mowing machine, in the hands of a Jap, cuts the butts from asparagus

How a New Domestic Food I

Olive tree and palm tree at San Diego, Calif., planted by the mission fathers



Sorting the fruit for color. The dark-brown olives are separated from the light olives, and each is packed separately.

SINCE the dawn of history the olive has been the source of one of man's most important food products, olive oil. Attesting the length of its service to man, olive trees that saw the rise of the Roman Empire under the Cæsars stand in many gardens of the Old World in those countries that border the Mediterranean. Although broken and gnarled, some of these still bear fruit. The olive and its products continue to be of great importance to Mediterranean peoples. Spain has an area of more than 4,500,000 acres of olives and Italy more than 5,000,000 acres. In the Mediterranean basin as a whole it is estimated that the total area planted exceeds 12,000,000 acres.

The olive itself is prepared for the table in many ways. The Spanish-process green olive, the French-process ripe olive, and the salt-cured, Greek-process olive are best known to American consumers. Of these, the last named is much used in Mediterranean countries.

The southern European feels that he must have his wine, and, of about equal necessity, his olives and olive oil. Consequently, when Father Junípero Serra and his brothers of the Franciscan order came to California they brought with them from Mexico both of these famous fruits of old Spain. Strange as it may seem, the most important olive variety now grown in California is the one introduced by the old Mission fathers, and it is appropriately known as the Mission variety. Incidentally, it is a variety of high oil content, good size, and rich flavor—properties that have made it suitable for the preparation of oil or for pickling. The olive was probably brought to California about 1780. Many of the first olive trees planted in the state are still in bearing on the grounds of the old Mission San Diego.

The Spaniards grew the olive in California largely for its oil; and, as the white population of the state was small until after the gold rush, plantings were confined to areas near the missions. About 1880 the industry of California underwent a boom, owing to the belief that profitable crops of fruit could be produced in poor soil and with little moisture. Large areas of land in semi-arid districts were planted under this belief, only to prove

CALIFORNIA RIPE OLIVES

History . . . Research . . . Technology of Processing . . . Grading and Marketing

By W. V. CRUESS
Fruit Products Laboratory
University of California

d Industry

Was Established

Packing olives in glass containers at the plant of the Curtis Olive Company, Long Beach, Calif.

the contrary fact—that olives do not bear abundantly and profitably under such conditions. They must have good soil and sufficient water. However, many of the groves were planted on good soil served with irrigation, and in time the trees bore large crops.

As the trees came into bearing it was found that the oil mills could not dispose of the crops profitably; an additional outlet was needed. Accordingly, the French pickling process was adopted, and olives were sold in bulk on the Pacific Coast for many years. The French process is simple. Ripe olives are placed in a moderately strong lye solution, of about 2½ to 3 per cent sodium hydroxide, for a time long enough for the lye to penetrate to the pits and thereby destroy the natural bitterness. The lye is then leached from the fruit with water, which is changed several times daily during the process. The olives are then preserved in strong brine, in which they are distributed to the retail trade in bulk, in small kegs or in glass containers. Often the olives are packed in olive oil in glass, together with anchovies.

As production still further increased it was found that the Pacific Coast markets could not take care of the

crop. Also, that the brine preservation process did not hold the olives against spoilage for more than five or six months. Some means of extending the marketing season throughout the year and of reaching Eastern markets was needed. About 1901 packers of olives discovered the fact that ripe olives could be preserved by heat in hermetically sealed containers, in much the same manner as other fruits are preserved by canning and sterilization by heat. The Ehmann Olive Company, of Oroville, and the Gifford Olive Company, of San Diego, were pioneers in the use of the canning process for olives.

No longer is the ripe olive a product for California markets only; it is a well-known and popular table relish throughout the United States. It has even invaded one of the Old World markets—London, where it is on sale in most of the high-glass grocery stores. The average pack is now about three-quarters of a million cases each of two dozen quart cans or their equivalents.

The Fruit—The principal variety of olive used for pickling in California is the Mission, but three other important varieties are used. Two of these are of Spanish origin, and are well known to all consumers of green olives as the Queen olive, the large variety used in Spain for green pickling, and the Manzanillo—a small variety of rounded contour, used for the preparation of pimiento stuffed olives in Spain. The Queen olive is more properly called the Sevillano, or the olive of Seville—its place of origin. The fourth important variety is the Ascolano, a large olive originating in Italy, where it is known as the Oliva Bianca d'Ascoli, or the white olive of Ascoli. It is an important table olive there. The Mission is of medium size only, but surpasses the three other varieties in flavor and in oil content; those who "know," buy the Mission in preference to the other varieties.

California olives are for the most part grown in groves of moderate size, from 10 to 50 acres each, in the central portion of the Sacramento Valley, in the upper San Joaquin Valley, or in the Los Angeles district in southern California. The olive requires a hot summer climate and does not do well near the Coast.

The fruit ripens from about the first of October until the first of December, and during that period most of the crop to be used for ripe processing is harvested. Olives to be used for oil are allowed to hang on the trees until late in December or January, so that the fruit will attain maximum oil content. Only the Mission and the Manzanillo varieties are used for oil, the Queen and the Ascolano having too low an oil content for the purpose.

For ripe pickling, the olives are picked when they have attained their first blush of color. If the fruit is allowed to become completely colored, the texture is too soft to withstand factory operations. Only the larger fruit is picked for canning purposes. The small fruit is left on the tree for later harvesting and oil making. Small lug boxes are used in the orchard; large lugs, such as used for pears and peaches, would permit too much bruising. Also, great care is taken to avoid bruising during picking.

Shipping and Storage—If the olives are to be shipped by rail or by truck any great distance they are placed in brine (4 to 10 per cent salt) in 50-gal. barrels, or in large wooden vats, and shipped thus in order to avoid bruising during transit. For short hauls, small lugs are used.

Some packers place the freshly picked olives directly in the pickling vats; others, the majority, store them in brine for several weeks, so that the olives may undergo a lactic acid fermentation and permit toughening of the flesh by the salt of the brine. In many plants the olives are stored in 50-gal. barrels; in others large wooden vats are used. Some of these vats are of 20,000 gal. capacity. They are somewhat like the vats used in the storage of cucumbers for pickling. To keep the olives submerged in the brine a wooden head is fitted to the vat several inches below the surface of the brine. The brine is gradually "built up" by the addition of salt until it reaches about 8 per cent salt in most plants and 10 per cent in some. During storage it is customary to stir the brine occasionally, by pumping over, and to skim the vats, if indoors, to remove mycoderma, or mold films.

The usual period of storage is from two to six months. However, olives have been stored in this manner satisfactorily for more than two years. A storage period of a year is not uncommon.

Brine storage has advantages over immediate pickling of the olives direct from the grove. First, it greatly prolongs the season, and thus permits the pickling of a much larger tonnage of olives with given equipment than is possible by pickling direct from the grove. It permits the olives to undergo a preliminary fermentation, which results in conversion of the sugar to organic acids, chiefly lactic acid and carbon dioxide. Bacteria that grow at this period also utilize much of the other bacterial foods, such as inorganic salts and soluble nitrogenous compounds. Olives after fermentation in this manner are therefore a much poorer medium for bacterial growth than are the fresh olives. Fermentation and brine action render the olives firm in texture—a desirable characteristic from the processing standpoint. Finally, storage permits pickling during the cool winter months, at which time the low temperatures tend to inhibit bacterial growth. From all of which it may be inferred that one of the pickler's problems is bacterial spoilage during pickling. The deduction is correct. It is also true, for the reason just given, that preliminary storage in brine greatly minimizes the losses from this cause.

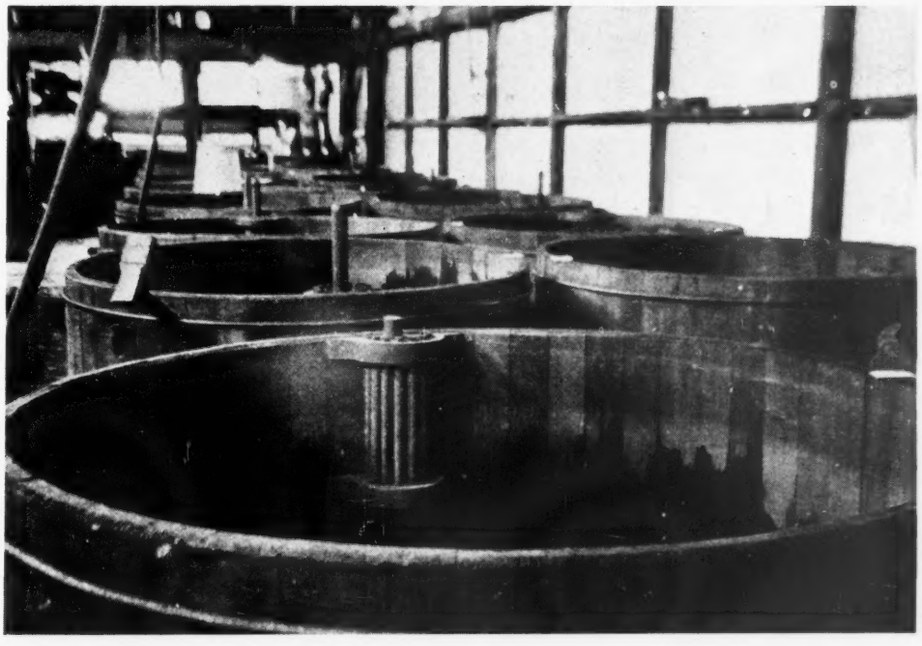
Darkening the Color—The olive as it comes from the grove is ripe, but it is not of the black and attractive color so well known in canned ripe olives. Neither are the olives artificially colored with a coal-tar dye. The black color is natural to the product and is attained during the regular pickling process. In passing, I might state that olive packers speak of the treatment of the olives as "curing," not as "pickling"; or they call it "processing." A "pickler" is known as a "processor." I use these terms interchangeably.

The darkening of the color is accomplished by oxidation in the presence of slight excess of sodium hydroxide. This is ordinarily accomplished as follows: The olives, either direct from the orchard or from storage brine, are placed in shallow concrete or wooden vats, and a dilute solution of sodium hydroxide is added. This is usually 1 to 1½ per cent NaOH (soda lye); but in some factories it is weaker than this—as low as ½ per cent NaOH. This lye is allowed barely to penetrate the skins and is then removed. The olives are then exposed to the air and allowed to darken by direct contact with the air, or they are placed in water through which air is bubbled continuously. Good results come from either method.

The olives must be stirred frequently, to avoid spotting of the surface at points of contact of the olives with each other. Preliminary exposure to air or first aëration in water lasts from two to four days. The lye application is then repeated several times, but with much weaker solutions, usually not in excess of ½ per cent NaOH. Between each lye application the olives are

exposed to the air for 24 hours or are aërated in water for a like period. Repeated lye applications and oxidation convert the tannins of the olive to a black color, much in the same way that pyrogallic acid is darkened by oxidation in alkaline solution. The olive flesh fixes much of the color.

Destruction of the Bitterness—As it comes from the tree the olive is intensely bitter, owing to the presence of a supposed glucoside. A favorite trick played upon unsuspecting Easterners is to hand them a large black olive off the tree, of lustrous appearance, and then watch the "fireworks." Alkaline substances destroy the bitterness by hydrolizing it. The ancients used wood ashes for the purpose. Modern olive packers use lye—ordinary commercial sodium hydroxide. The usual concentration is one-half of 1 per cent NaOH. The lye solution is applied after the aforementioned darkening process and is allowed to penetrate completely to the pits of the olives, so that all bitterness may be destroyed. Progress of the penetration is followed by the application of phenolphthalein, as an indicator, to the cut surface of the sample.



Redwood pickling vats at Palermo, Calif.

Leaching Out the Lye—Following the application of the lye used to destroy the bitterness, the olives are placed in water, which is changed frequently for about a week, until the olives are free of lye. As in lye treatment, dilute phenolphthalein solution is applied to the cut surface of several specimens occasionally to follow the progress of the washing or leaching process. When the cut surface no longer gives a positive test with the indicator the olives are considered ready for the final step in the pickling or curing process—that of several days' storage in dilute brine.

Brine Treatment—The purpose of brine storage following leaching to remove lye is to develop the flavor of the olive and to remove the final traces of lye or bitterness. It also reduces the tendency of the olive to shrivel from salt action during the canning operation. Storage in brine is usually for three to five days, and the brine contains from 2 to 4 per cent of salt. During the storage period the brine is increased in salt concentration—from about 2 to 3½ per cent.

Packaging and Sterilizing—In most canneries, tin cans of the familiar elongated pint and quart pattern are used for ripe olives. Glass containers are also used in several of the leading plants, especially for the largest sizes of olives. Before packaging, the olives are carefully hand sorted to remove defective fruit and to separate it into two or three colors—brown, or dark brown; light brown, and black. They are also sized by mechanical graders.

Investigations at the University of California laboratory have demonstrated that enamel-lined cans are much superior to plain-tin cans for ripe olives, because they retain the color of the fruit much more satisfactorily. The olives are packed into the cans by weight. Grading is so carefully done previous to canning that any given size of can will contain within one to three olives (for quarts and pints) of the number of olives required by the trade for the grade. The label usually designates, in addition to the net weight of the contents, the number of olives in the can or jar.

The cans are next filled with a hot dilute brine; usually about 3 per cent salt—12 deg. salometer. They are exhausted, or heated in live steam, for 4 to 6 min. and are then sealed in the usual manner in double-seaming machines. Finally they are placed in a cannery retort, a steam-pressure sterilizer, and heated to 240 deg. F. for 60 min. Next they are cooled in water in the retort.

The sterilizing operation is conducted under State Board of Health inspectors according to set procedure. Each and every retort is equipped with a temperature-recording device, and a record is made of each individual cook. Each batch or cook is given a batch number that appears on the cans of that batch and on the temperature chart. The present sterilization period and temperature were adopted as a result of the research conducted by the Hooper Research Foundation of the University of California and the Department of Bacteriology of Stanford University, under the direction of K. F. Meyer and E. C. Dickson. Spoilage losses after sterilization have been reduced to the vanishing point by this severe sterilization program, and the product is an absolutely safe one for the consumer.

Glass containers are sealed in vacuo and are processed, or sterilized, in a retort in water at 240 deg. F. for 60

Old-fashioned olive crushing mill and hand press, typical of machinery used in Europe

min. During the sterilization of glass containers air pressure is used in the retort to hold the jar caps in place. The water is agitated by the air or by circulating it in the retort during the sterilization process, to ensure even heating throughout the retort load. Cooling is conducted under air pressure also, and very carefully done in order to avoid breakage. The glass container is an attractive package for the ripe olive.

Grades and Grading—The olive is closely graded for size, both before pickling in most factories and again after pickling. Several types of graders are used, but all producers grade the olive on the count-per-pound basis, although the diameter of the grading screens or slots is expressed in sixteenths of an inch and the fruit is bought from the grower on the basis of diameter rather than on count per pound. Most graders have adjustable grading screens, or machines that are in some manner arranged so that grading can be adjusted to suit the variety of fruit being graded. Some olives are elongated and slender; others are nearly spherical, according to the variety. Thus a given diameter of grader slot or screen opening will often give a totally different number of olives per pound of one variety than of another. Graders equipped with parallel-moving steel cables or round belts, in either case diverging from the receiving toward to the exit end of the grader, are coming into favor.

The following are the size of grades adopted several years ago by the California Olive Association. All the sizes and designations are closely adhered to by all members of the association and by most of the leading independent packers who are not members of the association:

Size Designation	Number of Olives to the Pound.
Colossal	35—45
Jumbo	45—55
Giant	55—65
Mammoth	65—75
Extra Large	75—90
Large	90—105
Medium	105—120
Small	120—135

The California Olive Association—Most producers of food products are members of one or more trade associations. In general this is desirable, for as a rule trade associations serve one or more useful purposes. Several years ago the packers of ripe olives formed an association for the usual purposes of trade promotion, a better understanding between packers, and general industry welfare; but also, in addition, for the important purpose of industry protection. The manager of the association is Frank Simonds, who is also manager of the Sylmar Packing Corporation, one of the oldest and largest packers of olives in California. The Secretary is J. J. Hoey, who has been the official spokesman of the industry for many years, first as the able editor of the *Olive Journal* and later as secretary of the Olive Association. He is on the job every minute, taking care of the many problems that arise and promoting the welfare of the California olive industry. Recently the association staged a successful national advertising campaign. Once a year the olive packers and processors (picklers) assemble at some central point to discuss such technical problems of pickling, canning, and sterilization. The secretary plans and arranges the meeting. The meetings result in beneficial exchange of ideas and in the improvement of factory processes. Simplification and standardization of processing procedure is desirable. Considerable headway has been made on this problem at past olive packers' and processors' meetings.

Research—As stated elsewhere in this paper, valuable research was conducted several years ago by Meyer and Dickson on the sterilization of olives. The results have been put into commercial practise with marked benefit to the industry. In correlation with their research, important investigations were conducted in the Fruit Products Laboratory of the University of California on methods of pickling that would render the olive resistant to the high temperatures of sterilization found necessary by the investigators of sterilization methods. The modifications in factory thus rendered were determined and adopted by the industry.

An investigation of the bacterial spoilage of olives during pickling in this same laboratory resulted in the development of preventive and control measures that have also been generally adopted by the industry.

In other words, the olive-packing industry is quick to avail itself of the results of research where such results can be shown to improve the product or the process. Such an industry will progress.

Continued Prosperity Indicated by Basic Economic Factors

Nationwide Optimism Centering Around the Personality of Mr. Hoover Presages Continued High Business and Industrial Operations at Least During First Half of New Year 1928 a Record Year in Many Ways

By Robert M. Davis
Statistical Editor, McGraw-Hill Publishing Company

IT IS with an almost unanimous feeling of confidence and optimism that American business and industry face the new year. The year just closed has been a remarkable period economically in many ways. Almost every manufacturing group has turned in a report of record operations, especially during the latter half of the year. General construction has exceeded that of 1927 by over 14 per cent; general employment has reached record proportions; average weekly earnings of wage earners at the close of the year was the highest since 1920; corporation earnings advanced materially over the record for 1927; retail trade exceeded the year previous by wide margins; and the purchasing power of the American people, both urban and rural, was substantially increased. The year ended with industrial and general business activity above the estimated normal, a condition that was maintained practically throughout the entire year.

Favorable Economic Factors on Horizon

Many factors presage that whatever the course of business may be during the year 1929 as a whole, the first quarter of the year is almost certain to witness business and industrial activity of abnormal proportions. There are five outstanding favorable factors underlying the outlook as the new year opens. First is the election of Mr. Hoover. The election still maintains a lead as a favorable factor in the thinking of American executives, becoming important from the standpoint that the administration will be unchanged for the next four years. Settlement of the political situation dispels the uncertainty that was rampant during the year, an uncertainty which of itself must necessarily tie up business. Corporations and other large industries can now make their plans with certainty in regard not only to next year, but for the next four years, for they can see a continued prosperity, inevitable with an economist and business leader at the helm.

Secondly, a general optimism and confidence in the future prevails through the entire country. The psychological effect which is taking place due to such a general confidence in future prosperity is most favorable. At the center of this confidence is Mr. Hoover. The forthcoming administration promises to be essentially sound from a business standpoint. This mental state of the nation alone gives to all business a hope and optimism which foretells advancement and prosperity.

The third favorable factor is that of the materially improved agricultural conditions. The farmers see large hope of farm relief with Mr. Hoover's election and find themselves in a satisfactory condition which is the result of abundant crops and fair prices. The agricultural situation is computed by the Standard Statistics Company to be on the most profitable basis for a decade. It is estimated that the value of the nine leading farm products for 1928 is 5.9 per cent greater than in 1927. The profit margin, however, has increased even more, as costs have been reduced through the liquidation of old debts and the greater use of labor-saving machinery.

Less Unemployment and Wages Higher

Fourth in importance as a favorable factor toward a continuance of present prosperous conditions is the decrease in unemployment, and a continued upward trend in wages, with the cost of living remaining about stationary, resulting in a widely distributed high consumer purchasing power. The mere fact that record manufacturing activity is prevalent does not of itself reflect prosperity or even a sound economic condition, for such a condition, though it undoubtedly implies a large volume of aggregate purchasing power, must be backed by a widely distributed high consumer purchasing power. The record manufacturing operations of the past year have been balanced by a ready demand of the consumer, a demand that has been even stronger with the enhanced position of the American farmer. According to the latest data of the National Industrial Conference Board, the present purchasing power of the nation as a whole in deflated dollars, or real purchasing power, is 55 per cent over that of 1909, and in current dollars is 173 per cent over 1909. The increase in real purchasing power per capita is 20 per cent over 1909, and that of the gainfully employed is 35 per cent over 1909.

The fifth important factor is the maintenance throughout the distribution branches of business of mimimum inventories, and quick turnover. Small stocks are in the hands of both wholesalers and manufacturers, which condition presages a fairly constant volume of business during the next three months at the least.

Other favorable factors include materially improved conditions in several industries that were operating on a low scale during the first part of 1928, a continuance of favorable underlying credit conditions even during a period of comparatively high money rates, continued high general construction, increasing exports with an increasing favorable trade balance, and a continuance of economic progress in foreign countries.

Unfavorable Economic Factors

But there are also economic factors that may seriously disturb the even tenor of affairs if they continue over an extended time, or increase in their influence. First among these is the speculation frenzy and the stock market skyrocketing trend. The fact that the stock market is so unstable seems to indicate possible fluctuations in business conditions, and many thinking men fear that a break in the stock market might cause financial unsettlement. Not only has the selling of stocks at inflated prices caused a high interest rate which must be paid by the business man, but money is being diverted into the financial districts, in the extensive gambling in stocks, which should have been used as credits for productive purposes.

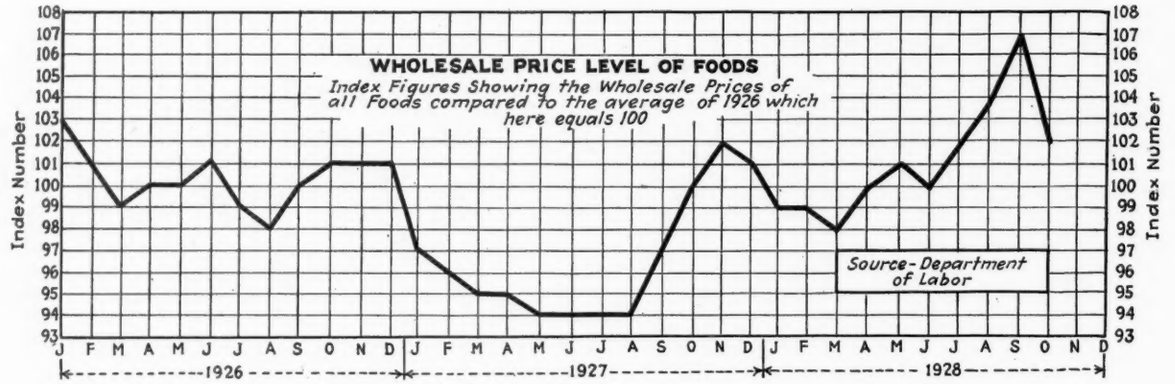
Entrance into the family of stockholders by the general run of American citizen, however, is a reflection of confidence in present economic conditions. The feeling is general that American business and industry are entering an era of prosperity such as has never before been known. If this belief is borne out, the leading corporations of the country will enjoy increased earnings and increased profits, which means more money with which to pay dividends. These increased earnings the public is anxious to share, and the desire is reflected in the increased interest in capital stock ownership.

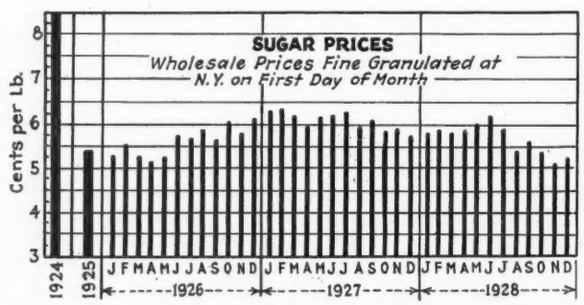
A second unfavorable factor is the keener competition prevalent throughout the distribution field. Through their keen competition the tremendous growth of chain stores and mail-order houses is beginning to affect numerous businesses, especially selling channels. Competition is generally becoming of the cut-throat variety, because retail establishments are increasing, and not increasing in proportion to increased population. This close competition cuts the margin profit, as prices are continually slashed.

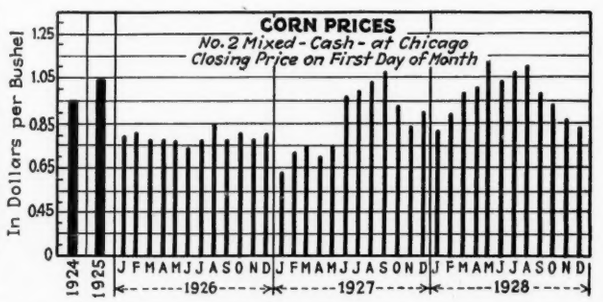
High money rates, as a direct result of stock speculation, are prevalent all over the country, forming a third adverse economic influence. Although authorities seem to agree that probabilities at this time favor the continuance of firm money next year, they also agree that ample resources for further credit expansion exist in the federal reserve system. There is every reason to believe that there will be no lack of credit. It is certain that as long as there is still room for credit expansion, any slowing up of business and industry for the purpose of readjustment will be but temporary. If these relatively high money rates continue, however, there is a strong possibility that the operation of business and industry

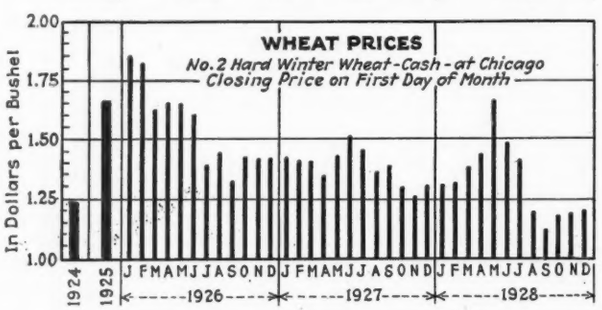
(Continued on page 178)

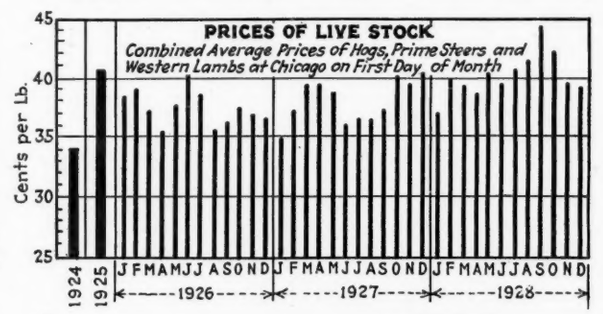
Statistics of Food Industries

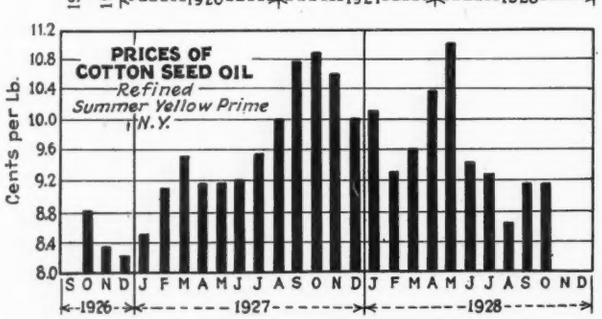

WHOLESALE PRICE LEVEL OF FOODS
Index Figures Showing the Wholesale Prices of all Foods compared to the average of 1926 which here equals 100
Source - Department of Labor
Index Number
1926
1927
1928

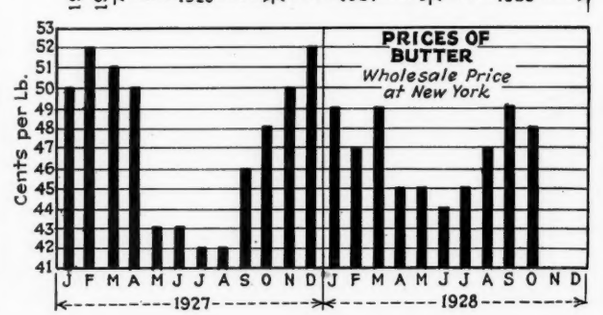


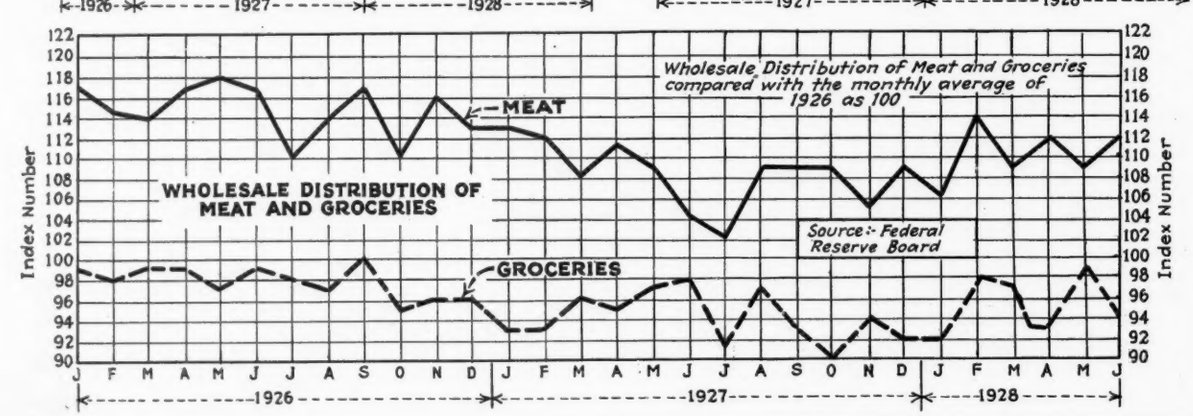




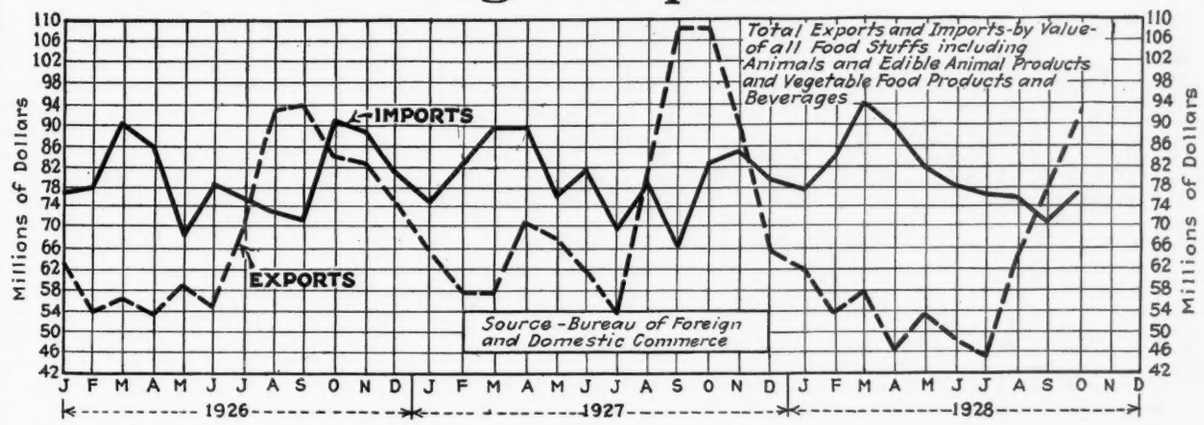


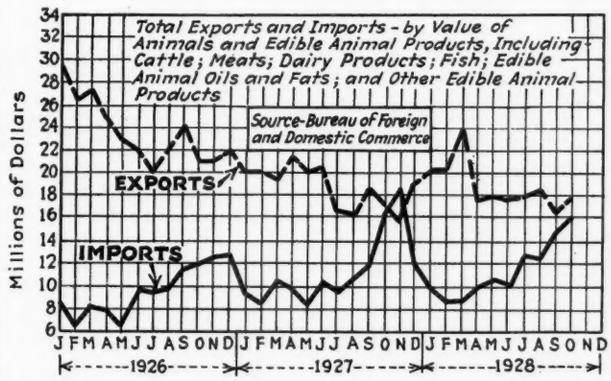


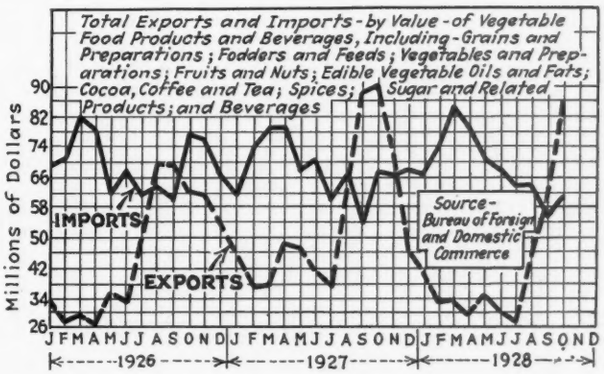


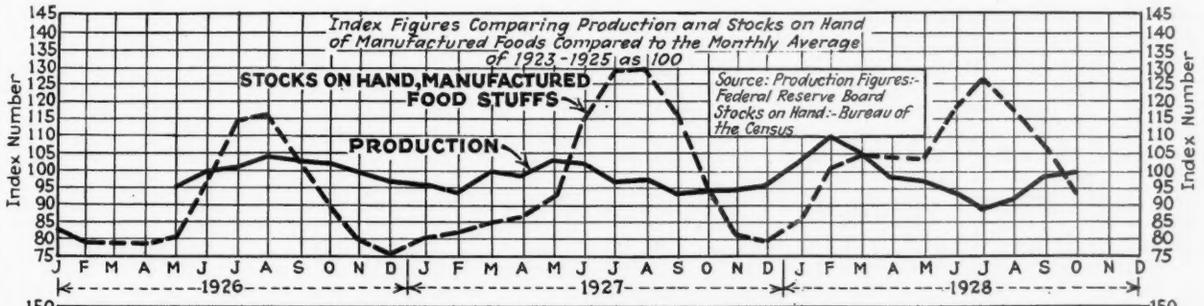


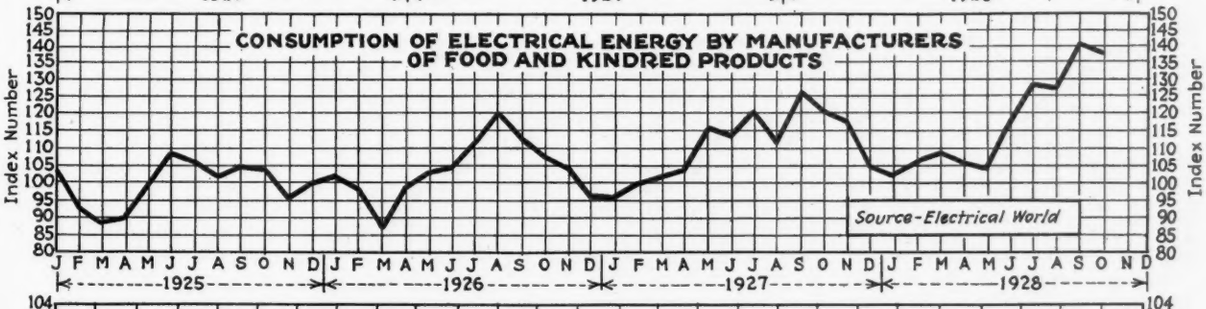
Afford Interesting Comparisons

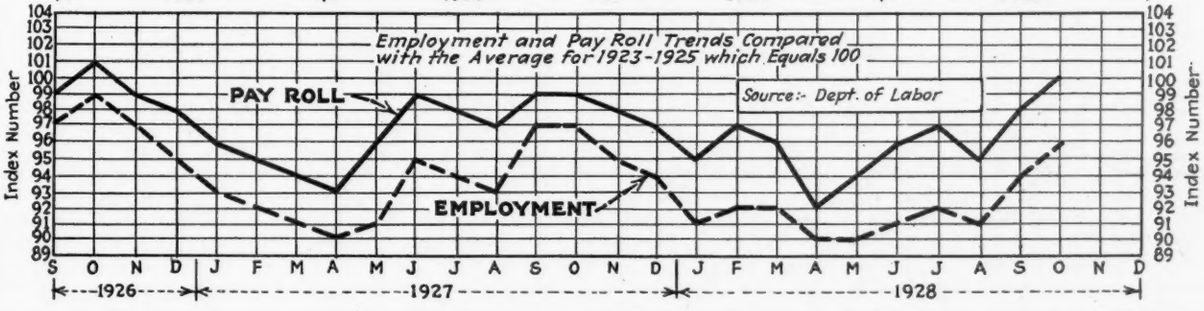

Total Exports and Imports-by Value-of all Food Stuffs including Animals and Edible Animal Products and Vegetable Food Products and Beverages
IMPORTS
EXPORTS
Source-Bureau of Foreign and Domestic Commerce
Millions of Dollars
1926
1927
1928


Total Exports and Imports-by Value of Animals and Edible Animal Products, Including-Cattle; Meats; Dairy Products; Fish; Edible Animal Oils and Fats; and Other Edible Animal Products
Source-Bureau of Foreign and Domestic Commerce
EXPORTS
IMPORTS
Millions of Dollars
1926
1927
1928


Total Exports and Imports-by Value-of Vegetable Food Products and Beverages, Including-Grains and Preparations; Fodders and Feeds; Vegetables and Preparations; Fruits and Nuts; Edible Vegetable Oils and Fats; Cocoa, Coffee and Tea; Spices; Sugar and Related Products; and Beverages
IMPORTS
EXPORTS
Source-Bureau of Foreign and Domestic Commerce
Millions of Dollars
1926
1927
1928


Index Figures Comparing Production and Stocks on Hand of Manufactured Foods Compared to the Monthly Average of 1923-1925 as 100
STOCKS ON HAND, MANUFACTURED FOOD STUFFS
PRODUCTION
Source: Production Figures:-Federal Reserve Board
Stocks on Hand:-Bureau of the Census
Index Number
1926
1927
1928





during 1929 will be slightly under those of 1928. It is regarded as a certainty, also, that the rate of each twelve-month gain in business operation during the coming year will not be as high as was recorded, especially during the second half of 1928.

One of the chief complaints of business men is the general trend of cutting prices to increase volume, the cut prices serving to decrease profits, and this trend must be regarded as the new year's fourth unfavorable factor. The keen competition now in effect is causing many manufacturers to operate at a loss.

Other unfavorable factors are depressed conditions in some of the basic industries, such as the coal and shipping industries; the incomplete agricultural recovery; excessive installment buying; selling and distribution costs; and the readjustments resulting from the mechanization of general industry.

Subjects Uppermost in Thinking of Business Men

In addition to these outstanding favorable and unfavorable economic factors, there are other phases of business that loom large in the current thinking of business executives. All business men are interested in profits, how to carry on production to show the greatest profit and to get away from volume business at little or no profit. This "profitless prosperity" is viewed with alarm by manufacturers who see their prices cut, volume increasing, but profit margin slight.

There is no doubt, however, that the earnings of corporations during the later part of 1928 were materially better than during the same period in 1927. The earnings of 165 corporations in the third quarter of 1928 were 32.4 per cent above the earnings of the same period in 1927, and practically any well assorted industrial group recorded earnings above 5 per cent over 1927. The earnings of corporations showed a progressively increasing percentage of gain over the corresponding quarter of 1927 in each of the first three quarters of 1928. Some of the remarkable gains made during the third quarter over the same period in 1927 are as follows: motor equipment 162 per cent, petroleum 126 per cent, copper group 117 per cent, machinery and machine tools 70 per cent, iron and steel 51 per cent, automobiles 25 per cent, retail chain stores 21 per cent, building materials 15 per cent, chemicals 12 per cent, and food 7 per cent. As the fourth quarter of 1927 witnessed a serious decline in earnings, it is certain, with the known record industrial activity of the past few months as a background, that the twelve-month gains in earnings during the last quarters of 1928 far exceeded those for any previous quarter in the year.

The tendency toward group ownership, consolidation and mergers is also receiving much serious consideration of American business men. Consolidations are having a noticeable effect on present business practices and new economic problems are arising in these vast mergers of manufacturers. Retailers are intensely interested in the effect of chain store systems upon old type local stores, which give local store service and credit. Business is tending toward amalgamation, combinations, and the elimination of all middlemen, bringing the consumer into closer relation with the manufacturers and tending to cut the spread between production cost and ultimate selling price.

Business men as a whole are keenly interested just at present in the tariff question in all its phases. Many believe that in the revision of the tariff schedules lies a method of maintaining present-day living standards, and a protective tariff is demanded for farm products as well as for textiles, leather, and woolens.

American Industry Faces the Future Confidently

The various industrial groups face the near future with varying degrees of confidence, based very largely upon the degree of prosperity experienced during the last half of 1928. Manufacturing industry as a whole was operating on a comparatively high plane throughout the year, but attained its greatest momentum during the latter half of the year, the peak being reached in November, when the rate of operations was 17.2 per cent above the same month in 1928. The year as a whole witnessed operations of general industry on an average of about 7 per cent over 1927.

The coal industry closed the year in distinctly better condition than was the case before the cold weather set in. Following a period of dullness extending over nearly two years, the principal anthracite companies close the year operating at nearly capacity, which condition, with anything like normal weather as a background, should continue through the first part of the first quarter of the new year. The improvement started so late in the year, however, that it is almost a certainty that the great majority of anthacite producers will show profits for the year 1928 on a lower level even than the unsatisfactory results of the preceding year. The bituminous coal situation also closed the year in an improved condition, but was still far from strong. For the companies now in operation, it is probable that some slight increase is in prospect; but should prices increase sufficiently to yield a satisfactory return, a rush of new producers into the market would doubtless follow, causing a return to former depressed conditions. The construction industry closed the year on a high plane, with the accumulated volume of contracts awarded during 1928 some 14 per cent over 1927. It is apparent that, barring an unexpected credit strain, any real let-up in building activity will not be experienced in the near future.

Rolling mills and steel plants maintained a rate throughout 1928 materially over that of 1927, and turned in a production report for the year of about 12 per cent over 1927. With the mills well booked for early 1929 delivery and an unexpected increase in automobiles and building steel demand, there is promise of first-quarter 1929 outputs comparing favorably, if not exceeding, the large first quarter of 1928 output; and prices will probably be slightly higher, affording assurance of generally adequate earnings.

The automobile manufacturing industry, including the production of repair and replacement parts, has experienced a most unusual year. The average rate of operations in these plants during 1928 was about 30 per cent over that during 1927, the peak of operations being recorded in September. So far as the first half of 1929 is concerned, the prospects for a higher rate of operations in the automobile manufacturing plants are very promising. Stimulated by the introduction of exceptionally attractive new models, business probably will reach a higher level than in the first half of any preceding year. The parts and accessories branch of the automobile industry should also face the future with confidence. With automobile production promising to hold at an unusually heavy volume during the early months of 1929, the demand for parts and accessories should continue active in the first part of the year.

Operations for 1928 Compare Favorably with 1927

Perhaps the industrial group witnessing the greatest increase in operations and showing excellent prospects for 1929, is that of machinery and machine equipment. Orders booked by the machine tool industry last October were the largest of any month since March, 1920, and were 113 per cent greater than those of October, 1927. A study of past years' operations would indicate that orders would normally be expected to decline during the fall months; during 1928 a contrary trend was established, with an October gain of 7 per cent over September. Although November witnessed a decrease in orders, due chiefly to a seasonal recession, the close of the year found the machine tool industry in the aggregate holding at a level substantially ahead of the corresponding period for 1927. Even in the automobile trade demand continues above normal: the farm implement, electrical, and metal working industries are buying actively; and the requirements of the aviation industry are expanding steadily. The indications are that most machine tool producers will continue to operate at near capacity rates, at least in the early parts of 1929. With profit trends in general satisfactory, and the near term outlook bright, the excellent earnings achieved during 1928 should be repeated during at least the first quarter of 1929.

And so American business and industry as a whole closes the book for 1928 with an unprecedented record in production and profits, and looks forward to the new year with confidence and with the expectation of a continuance of these conditions, though with the rate of operations in the aggregate probably not much above those witnessed during 1928.

ABSTRACTS · OF · CURRENT · LITERATURE

FLUORESCENCE OF OILS. J. F. Carriere. *Chemisch Weekblad* 25, 632-4, Nov. 10, 1928. It has been stated that raw oils do not fluoresce and refined oils do. This statement is in error; no oil nor fat, raw or treated, has yet been found that will not fluoresce if properly irradiated and properly observed. It must be remembered in making the observations that fluorescence is to be observed by reflected, not transmitted, light. The surface, not the sides of the liquid, should be irradiated and examined. Thus, an oil strongly fluorescent by surface observation may absorb ultra-violet light so strongly that from the sides it appears non-fluorescent. It is true that refining often changes the fluorescence color: a raw oil may show almost any color, depending on its composition; but for the refined oil the color is characteristic. Fluorescence of peanut oil and of soy bean oil is discussed in the light of these considerations. The observer who wishes to make use of fluorescence as a means of identifying oils or fats should also give due consideration to the points raised.

* * *

GLYCERIN BY FERMENTATION. Yoshinori Tomoda. *Chemical News* 137, 265-6, Oct. 26, 1928. In the fermentation of sugar in presence of sulphite for simultaneous production of alcohol and glycerin, it has been found that the two fermentations proceed simultaneously from beginning to end. At a given total sulphite concentration, glycerin yield is in direct proportion to the sugar concentration; at a given sugar concentration it is proportional to the square root of the total sulphite concentration. An equation is derived for the most economical sugar and sulphite concentrations. Glycerin formation is favored by making the medium slightly alkaline with soda.

* * *

YEAST CULTURE. Oscar W. Richards. *Journal of Physical Chemistry* 32, 1865-71, December, 1928. Rate of growth of yeast, expressed as the tangent of the angle of the growth curve with the time axis, was measured with a pure strain started from a single cell. The experiments were made in such a way that growth was not retarded by the products of metabolism of the yeast, as occurs under natural conditions. In this way the manner in which rate of growth varies with temperature could be accurately observed. From 4 to 30 deg. C. there is steady increase of rate of growth, but the rate of change alters at 9 deg. C. Above 30 deg. C. the growth rate decreases. At 30 deg. C. abnormal cells are formed, which indicates that this temperature, commonly used as an incubation temperature, is instead a critical temperature. This is at least true for the pure strain (*Saccharomyces cerevisiae*) used in the tests. Whether or not it is true for other yeasts, it is at least apparent that better knowledge of temperature relations and closer temperature control would be helpful in practical yeast propagation.

* * *

ULTRA-VIOLET BLEACHING. A. Quilico. *Rivista Italiana delle essenze e profumi* 10, 145, 168, Sept., Oct. 1928. Whether or not the bleaching of fatty oils can be successfully accomplished by ultra-violet light, it is shown that the method is applicable to essential oils. Irradiation experiments are described with several of these, including lavender and eucalyptus. Of these two, the effect was somewhat better with the eucalyptus essence. This is attributed to the greater preponderance of oxygen-containing compounds in the lavender essence; the eucalyptus oil consists, aside from its cineol content (53 per cent), almost entirely of terpene hydrocarbons.

* * *

COMPRESSIBLE SLUDGES. A. J. V. Underwood. *Journal of the Society of Chemical Industry* 47, 325-9T, Nov. 16, 1928. The resistance to filtration resulting from the combination of a filter cloth and a layer of a compressible sludge may be very much greater than the resistance of either layer alone. Equations are given for rate of flow through incompressible sludges, i.e., those in which the resistance is independent of the pressure. For compressible sludges resistance may vary directly with the pressure, or with its square or square root. Most compressible sludges encountered in actual practice are "inelastic"; that is, they are deformed and their resistance is increased by pressure, but when the pressure is released their resistance is not lessened. Flow equations are derived for the less common "elastic" type, in which release of pressure is followed by return of the resistance to its original value. From these, equations for the "inelastic" type are derived; also a general equation, applicable to both kinds of sludges. It is shown that in the filtration of heterogeneous compressible sludges evidence that a "scouring" effect occurs is still lacking; the errors introduced by neglecting the resistance of the cloth give results resembling those derived when the "scouring" effect is assumed.

* * *

SUGAR REFINERY EQUIPMENT. G. Jöbsis. *Archief voor de Suiker-Industrie* 36, 989-1008, September, 1928. The necessary installations for electrically-driven crushers, mills and refinery machinery are described and illustrated. A feature is an automatic motor-control device, useful for batteries of mills or other refinery machines where the control bridge is not equipped for starting and stopping the entire battery when repairs are made on a motor. Safety measures and devices are emphasized and specifications are given for safety fuses and insulation suitable for the described equipment. Meters and meter boxes, switches and switch cases are among the accessories described.

* * *

BLEACHING FATS. E. Richardson. *American Perfumer & Essential Oil Review* 23, 512, 571-2, Oct. and Nov., 1928. Physical methods for bleaching fats without changing their chemical properties are reviewed. The two principal methods (with fuller's earth and with activated charcoal) are given chief emphasis. The latter is comparatively expensive, but finds some application. Bleaching earths are cheap enough to be used on soap oils, even though the earth cannot be regenerated. The theory of roasted and activated earths is discussed. Trials of bleaching by exposure to light have been reported, but no commercial success has been achieved, even with ultra-violet light. On p. 572 reference is made to J. Middleton's report (U. S. Bureau of Mines) on the production and uses of fuller's earth from American deposits.

* * *

OIL REFINING. *Chemical Trade Journal* 83, 436, Nov. 16, 1928. Refining edible oils by the caustic soda neutralization process is both expensive and unsatisfactory because the yield of neutral oil is erratic, which makes the soap content variable and causes difficulties in bleaching, filtering, and deodorizing. All these complications are eliminated by the continuous distillation process, in which the free acid and odorous constituents are removed in a single operation of steam distillation in vacua. This gives direct and continuous production of a neutral edible oil of high quality and a byproduct acid oil. The process has been worked on a large scale in England for some years. Both operating costs and floor space requirements are much less than for the old method. The new process is also suitable for the deodorization of oils and fats which do not need neutralizing, e.g., cottonseed oil, hydrogenated fats, tallows and the like.

* * *

TINNED LEAD CONTAINERS. R. Van Winkle and W. G. Christiansen. *Journal of the American Pharmaceutical Association* 17, 1110-2, Nov., 1928. Tin-plated lead tubes and the like seldom, if ever, have a perfect coating of tin; microscopic examination reveals striations through which the lead can be seen. Analyses were therefore made of a foreign and an American make of

this type of container, with soapy and non-soapy contents, to ascertain whether toxic quantities of lead were absorbed. The foreign tubes were better coated than the American. The conclusion is that if such containers are made with at least 9 per cent tin they are quite safe.

* * *

FOOD IRRADIATION. *Journal of American Medical Association*, 91, 1832, Dec. 8, 1928. A short history of the discovery of the activation of foods by irradiation was given by Dr. Harry Steenbock before the meeting of the Chicago Pediatric Society. The discussion which followed revealed the opinion that there are real dangers of overdosage from the use of irradiated foods and medicinal products if such processes are practiced without adequate technical control. The danger is especially true of the widespread use of irradiated ergosterol which may contain more or less toxic impurities.

* * *

VIOLET RAY TREATED DOUGH. *Bakers Weekly*, 60, 60, Nov. 17, 1928. An English company has applied ultraviolet light to bread doughs to improve the color, texture, flavor, and volume of the loaf. This process is covered by English Patent No. 280,729. A mercury vapor light is hung over the dough mixer so that activation takes place during mixing, for the treatment is not effective during fermentation or other processes such as dividing, rounding, or molding.

* * *

IRRADIATED ERGOSTEROL. W. E. Dixon and J. C. Hoyle. *British Medical Journal*, 832, Nov. 10, 1928. The authors' observations demonstrate that grossly excessive amounts of irradiated ergosterol interfere with calcium metabolism to the extent that all the treated rats formed calcium phosphate concretions in the urinary tract. The amounts of irradiated ergosterol necessary to cause this disturbance were much larger than that found by German workers to be harmful. Therefore they suggest that some independent toxic factor complicated the latter's experiments.

* * *

HEAT FLOW. W. J. Ettinger and H. W. McPherson. *Refrigerating Engineering* 16, 169-74, Dec., 1928. In a search for a test method that would detect small differences in rate of heat flow into a refrigerator, the "ice meltage" and "heating" methods were both tried and abandoned. To meet the necessary conditions of constant temperature distribution both inside and outside the cabinet, the method of controlled evaporation of a refrigerant inside the cabinet was adopted. Latent heat of vaporization of the refrigerant was utilized for temperature control. Ammonia was selected as the refrigerant, largely because it could be easily measured by weight after absorption in acid. The testing procedure is described in detail. From the experimental data (shown in tables and curves) calculations of the rate of heat flow are made. Since the test was designed primarily to study the effect of structural features on thermal efficiency of cabinets, the method was used in comparative tests on an all-metal, sealed construction and a wood frame covered with sheet steel. In the former the door throats were made of a chrome iron with low heat conductivity; in the latter they were of wood. This was the essential difference, the two cabinets being nearly equal in insulation. The heat flow through the door throat is reported for the metal, but not for the wood cabinet. The test method showed itself to be sufficiently accurate and reproducible for all practical purposes.

TESTING REFRIGERATORS. Committee Report. *Refrigerating Engineering* 16, 137-59, Nov., 1928. This report is by a committee of the American Society of Refrigerating Engineers, appointed to consider the problem of tests suitable for expressing performance of refrigerators, to facilitate fair comparison of different makes, types, and sizes. The report includes papers on tests of mechanical and design features, rules for testing, refrigerator analysis and standardization, methods of test, and test boxes for electric refrigerators. Discussion of these papers is given. Room temperature and ice melting curves are shown, in comparison with ice-chamber temperature, volume, and other factors.

CRITICAL · BOOK · REVIEWS

CHEMISTRY IN MEDICINE. Edited by Julius Stieglitz. The Chemical Foundation, Incorporated, New York, 1928. Comprises 757 pages. Price $2.00

TO BRING together, in a single volume, the best thought in the field of chemistry that has physiological or clinical significance, interpreted by the masters of their respective specialties, so that it will be easily available to the field of medicine, Dr. Stieglitz, with an advisory committee consisting of Carlson, Hunt, Lillie, Mendel, and Wells, has drawn upon the entire resources of the North American continent to bring forth this volume. The great and rapid development of chemistry that should be known to the practitioners of medicine has heretofore been scattered in the voluminous scientific literature of the world and the multitudes of textbooks, with which only the bio-chemist could be expected to be familiar.

The editors have organized logically the very considerable amount of material from which they have drawn, having chosen the outstanding worker in each line of endeavor to contribute a well integrated, comprehensive survey of the achievements that have been accomplished in his field. Not only is the material ably presented, but it is very readable, for it has been one of their purposes that the volume shall be available to the layman as well as to the physician. A glossary of terms is appended that will enable the non-medical reader to understand any of its technical terms.

To review such a work completely is as impossible as it would be to review an encyclopedia, and one can only find words of praise for the forty contributing authors whose gratuitous work has been here assembled. Chemists whose active studies of bio-chemistry ceased as recently as three years ago will find this book a stimulating review, for its thought is essentially chemical in its nature, and the layman of an inquiring mind will be fascinated by its lucid and able presentation. Manufacturers of foods, who are interested in their products as related to the whole scheme of dietetics, will find much of value in this book.

L. V. BURTON.

* * *

HUNGER FIGHTERS. By Paul de Kruif, author of MICROBE HUNTERS. Illustrated by Zadig. Harcourt, Brace & Company, New York, 1928. Comprising 378 pages. Price $3.

IN this the second of Mr. de Kruif's books devoted to lively descriptions of the achievements of certain scientists who have accomplished noteworthy results are to be found dramatic accounts of our official and organized struggles with pellagra, hog cholera, the foot-and-mouth disease, and tularemia; of the introduction into this country of the Russian Kubanka and Khartov wheats and of the Marquis wheat in Canada; of the development of modern maize; and of certain of the vitamins—notably vitamin D.

In form it is biographical, in is essence historical; and its style is sprightly indeed. To those who like to take their information with a flavor of slang this book will be a delight; to other its ultra-modern phraseology renders it by no means incomprehensible. Such phrases as "Shull had done his stuff," are not entirely without meaning to even the highest-browed of professors. In view of its scholarly thoroughness, its intrinsic soundness, and its obvious honesty of purpose, one is not inclined to quibble over matters of literary style, although one who reads his books as entities really has no need for the rather too generous recapitulations at the outset of each succeeding chapter, a circumstance due, no doubt, to the fact that the material at least in part was published seriatim in *The Country Gentleman*.

To those of us in food manufacturing lines, the chapter entitled "The Sun-Trapper: Steenbock" will probably prove of the greatest interest, although every page of the 370 has on it something of greater or less interest.

R. G. GOULD.

· SELECTED · PATENTS ·

Manufacturing Starch and Gluocse

Charles R. Brown, Kansas City, Mo., and H. E. Nelson, Keokuk, Ia. No. 1,690,360. Nov. 6, 1928.

A method of steeping corn and preparing from it starch, glucose, gluten, and their byproducts, so that it will be substantially free from objectionable impurities and avoid the excessive washing, tabling, and handling of materials which are necessary with other processes. The method consists largely in avoiding iron contamination of the starchy materials which usually discolor the end products. The materials are steeped in a water-acid bath so as to render soluble many of the impurities that would otherwise be carried along with the starch and contaminate the glucose.

Cheese Compound for Bread Making

Ernest D. Lindsey, San Francisco, Calif. No. 1,690,688. Nov. 6, 1928.

A method of preparing a part of the ingredients of bread which is to contain cheese so that the cheese will be distributed uniformly throughout the dough and thus avoid a spotty loaf and pitted crust which occur where undesirable large chunks of cheese are scattered through the loaf.

The compound is prepared by mixing the sugar, salt, and shortening components together with milk or some other liquid and bringing it to a temperature of approximately 200 deg. F. At this point cheese is added and the mixture thoroughly mixed. The final solid is a semi-solid or paste-like substance and may be put into bottles or packages, and will keep indefinitely. When used by the baker, about 30 lb. of the compound is mixed with 100 lb. of flour, together with the proper wetting.

Method of Wrapping Cheese

Charles F. Doane, Salem, Ore. No. 1,693,694. Dec. 4, 1928.

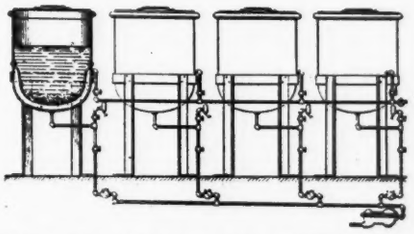
A method of wrapping cheese is described which attempts to avoid molding on the surface by heating the foil as it comes in contact with the cheese so that the surface of the cheese is melted and adheres tightly to the foil.

Cheese is cut from molded forms into the proper shape and size. The protective covering may be parchment paper, fine-mesh cloth, or metal foil such as aluminum foil, which is considered the most desirable on account of its high melting point and the fact that it does not tarnish or discolor the surface of the cheese. The cheese and foil are drawn simultaneously across a heated surface, which brings about the localized melting and tight adhesion to the foil or other protection coating without permitting the formation of air spaces.

Cooking Apparatus

Frank H. Montreuil, Chicago, assignor to Warren Webster & Co. No. 1,692,682. Nov. 20, 1928.

The patent covers a method of removing drainage from steam-heated cooking units and involves the use of a long



Removing drainage from steam-heated cooking units

water leg. When multiple units, such as shown in the figure, are connected to a common line for discharge of condensate, the pressure from the various vessels will vary according to the temperature within the vessel, and, where one is freshly filled with cold liquid, the pressure on its jacket will be much less than that found in the jacket where the liquid is boiling actively. The condensate will back up into the leg of the cooler vessel unless special provisions, such as are covered by this patent, are provided that will prevent it.

The theory involved is that, by placing a check valve at the bottom of the water leg, the accumulation of condensate above the check valve plus the steam pressure in the jacket itself will make a static head that will be equal to the pressure within the main. A means is provided for venting the air through an automatic thermostatic air vent. All of the condensate from a battery of kettles, for example, may be handled through a single large steam trap, thus avoiding trouble due to water backing up into cool vessels.

Preparing Spinach for Canning

William E. Thomas, Oakland, Calif. No. 1,685,511. Sept. 25, 1928.

A method of blanching spinach in order to retain the maximum amount of natural color, by blanching at temperatures sufficiently low to prevent solution of the chlorophyll in the wax of the chlorophyll carrying cells where the organic acids could then react upon it to form the brownish phaetophytin.

Washing is followed by blanching at temperatures below 160 deg. F. which will require a longer period to produce the desired amount of wilting than when boiling temperatures are used. After about four minutes treatment under these conditions the temperature may be increased without subsequent deterioration of color, and by this method the slow rate of blanching may be increased. Other canning and sterilization operations are carried out in the usual way.

Honey or Maple Butter

Glenn G. Griswold, Madison, Ohio. No. 1,686,556. Oct. 9, 1928.

A permanent emulsion of so-called honey-butter, or maple-butter, is described, the stabilizing agent being egg albumin, of which four ounces of the dry powder is used per gallon of extracted honey or maple syrup. Egg albumin is beaten to a froth in cold water, the syrup or honey added, and brought to a temperature of 180 deg. F. A pasty product results which will not revert to the liquid condition.

Sugar Spraying Apparatus

John R. Peterson, Sugar City, Idaho, assignor to Utah-Idaho Sugar Company, Salt Lake City, Utah. No. 1,687,178. Oct. 9, 1928.

An apparatus for the automatic spraying of sugar when being washed in centrifugals in a sugar refinery.

The sugar to be washed is charged into the basket, the latter is started in motion, and a measured volume of water is sprayed uniformly by a mechanically oscillated nozzle apparatus over the sugar.

Preservative Package

George W. Beadle, Rye, N. Y., assignor to Cellacote Company, Inc., of N. Y. No. 1,685,392. Sept. 25, 1928.

Fruits and vegetables are sealed in closely fitting, transparent, containers of hydrated cellulose, made from sulphite pulp sheets by a chemical process which will not be described here. The container may be made either by dipping fruit, for example, into solutions or a capsule may be molded which will shrink in place when dried. Beadle describes cantaloupes preserved in this way, when fully ripe, and shipped without refrigeration from the Pacific Coast to the Atlantic Coast, whose edible period was extended from ten to fourteen days after arrival.

Milk Pump

John M. McClatchie, New York. Assignor to the Borden Co., New York. No. 1,687,029. Oct. 9, 1928.

A pump is described which serves the double purpose of withdrawing milk from a vacuum pan and forcing it through a homogenizer. To accomplish this the pump must be so constructed that it will not only develop high pressure on the discharge stroke, but must also be able to create a high vacuum on the suction stroke. The latter is accomplished by having a piston head of a concave shape which fits closely around the valve housing with so little clearance that an unusually high vacuum is produced as it moves away on the suction stroke.

Drying Starch in Candy Factories

H. W. Harrigan, Medford, Mass., assignor to Hersey Manufacturing Company, South Boston, Mass. No. 1,693,649. Dec. 4, 1928.

A method and apparatus is described for treating and drying pulverized granular starch suitable for reconditioning molding starch such as is used in the manufacture of confectionery. Starch is dried by carrying it in a rotary drier, through which passes a current of heated air. The air is separated from the starch in a cyclone collector and cooled to condense the water before returning to the apparatus.

Warming and Stirring Apparatus

Aage Jensen, Los Angeles, Calif. No. 1,692,270. Nov. 20, 1928.

A small apparatus for quickly raising the temperature of a liquid, while stirring rapidly, such as sample of cream of heavy density, or malt extract, eggs, chocolate, and the like. The rotary impeller contains an electric heating unit. No scorching or cooking out of the product is found to take place.

Reducing Viscosity

E. A. Snow, Reading, Mass. No. 1,690,799. Nov. 6, 1928.

When ice cream mixes are homogenized the result is usually a fiuid that is often too thick, and viscous. The usual further cooling of the liquid increases the viscosity. Snow passes the discharge from the homogenizer through a valve in which a back pressure of only about 100 lb. per square inch is maintained in contrast to the homogenizing pressure of two to three thousand pounds per square inch. The result of passing it through the second valve seems to be to de-viscify the mixture, and the operation seems to be adjustable to any desired degree of fluidity.

Copies of Patents

Complete specifications of any United States patent may be obtained by remitting 10c. to the Commissioner of Patents, Washington, D. C.

Photostatic copies of foreign patents may be obtained at the same address, prices being forwarded on application.

Electrical Pasteurization of Milk

John O. Templeton, Detroit, assignor to Electropure Corporation, Detroit. No. 1,692,874. Nov. 27, 1928.

An apparatus is described for passing electric current through milk, whereby the bacterial content is destroyed by increasing the temperature. The patent seems to cover a method of heating milk electrically, with regenerative cooling to conserve the heat and reduce the amount of electrical power required. According to the patent, milk to be properly treated should be raised in temperature to about 155 to 165 deg. F., which is accomplished by means of an electric current, and the milk then flows through the regenerative cooler.

Dried Marmalade

H. L. Hulburt, Monrovia, Calif., assignor to Murray California Food Products Company, Azusa, Calif. No. 1,692,040. Nov. 20, 1928.

A process of manufacture of a dried marmalade which can be converted into edible condition in a very few minutes by boiling with water. Fruit is first carefully washed and stems and hard parts are removed. The outer peel, including the white pith, is then removed. The separated peel is now treated with an alkali containing substances such as salt solution, or solution of lime, for the purpose of softening the peel and destroying any undesirable mold spores or bacteria, and prevention of dark spots. The hot-water bath contains 1 per cent by weight of freshly added unslacked lime and is kept at a temperature of 180 deg. F. After treatment with the alkali-containing liquid, the product is washed in pure cold water, which has the effect of setting the color so that it will not be affected by sunlight. After the cold-water washing operation the peel is comminuted by slicing in very thin pieces. The sliced peel is then covered with dry sugar, powdered fruit pectin, and an edible acid. The peel is then dried at a temperature as low as possible, but not in excess of 150 deg. F., preferably in a vacuum, after which it may be packed with a further mixture of the jellifying materials either with or without an air-tight seal. Samples have been found to keep for two years without deteriorating from age. For use, the dried material is merely placed in water and boiled for a few minutes after which marmalade is formed.

Citric Acid Production

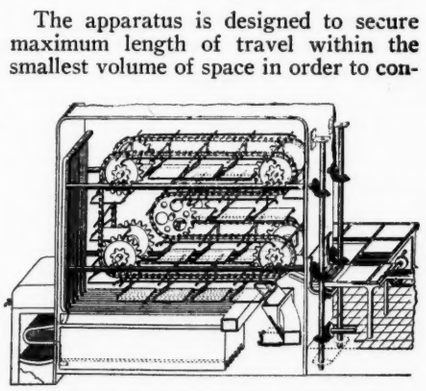
Auguste Fernbach, Paris, France, and J. L. Yuill, York, England, assignors to Rountree & Company, Ltd., of the Cocoa Works, York, England. No. 1,691,965. Nov. 20, 1928.

A process of manufacturing citric acid from cane sugar by means of a fungus fermentation. Instead of sterilizing by heat the liquors to be fermented, they are treated with comparatively large amounts of hydrochloric acid prior to inoculation with spores of the fungus. The acidity is found to be at its best between pH = 1.2 to pH = 2.5. Inoculation is by means of spores of aspergilli and incubation is carried out at temperatures between 10 and 40 deg. C.

Automatic Baking Oven

Fortunato F. Oviedo, Madrid, Spain. No. 1,692,515. Nov. 20, 1928.

The apparatus is designed to secure maximum length of travel within the smallest volume of space in order to conserve heat. By reference to the figure the method of travel can be seen.



Automatic baking oven designed to conserve heat

Egg-Preserving Compound

Henry Stanley, Galveston, Texas. No. 1,683,631. Sept. 11, 1928.

A mixture of materials in which to pack eggs, particularly for packing in a container that is air-tight, consisting of wheat bran, 92.76 per cent; sodium chloride, 7.01 per cent; yellow ocher mineral, 0.23 per cent. The inventor claims that the mixture will fill the pores of the egg shell, thus excluding air. The bran serves as a heat insulator.

Citric Acid Production

Auguste Fernbach, Paris, France and J. L. Yuill, York, England, assignors to Rountree & Co. Ltd., of the Cocoa Works, York, England. No. 1,691,966. Nov. 20, 1928.

A process for the manufacture of citric acid from sugars and like substances which include cane sugar, invert sugar, glucose, laevulose, maltose, other carbohydrates and glycerol as well as mixtures of these substances. See patent No. 1,691,965.

Egg Product

Albert K. Epstein, Chicago. No. 1,687,268. Oct. 9, 1928.

A method of treating egg yolks prior to freezing, so that no bacterial spoilage occurs when they are thawed out is effected by taking 99.2 lb. of commercial egg yolks, from which practically all of the whites have been removed, and adding to this amount 0.8 lb. of acetic acid, or its equivalent, mixing thoroughly, and then freezing. The method is stated to be suitable for use with other organic acids of an edible sort.

Egg Yolks

Albert K. Epstein, Chicago. No. 1,687,269. Oct. 9, 1928.

A process of treating egg yolks prior to freezing in such a way that the product when thawed out will be more mobile and fluid than would be the case when the treatment is followed which is given in patent No. 1,687,268. The patent covers the use of sodium chloride, or some other neutral salt, as an addition to the acetic acid or other organic acid. In preparing a lot of egg yolks for freezing, 95 lb. of egg yolk are mixed with 4.2 lb. of sodium chloride and $\frac{5}{16}$ of a pound of acetic acid, and then thoroughly mixed and poured into cans for freezing. The purpose of the treatment is to prevent spoilage taking place while the product is being thawed out.

Baking Hollow Rolls

Charles Wear, Waltham, Mass., assignor of one-half to Joseph Pollak. No. 1,690,882. Nov. 6, 1928.

A method of baking a so-called Frankfort roll with a hole in the inside by use of a core in the baking pan. When baking is complete, the pans are inverted and the cores extracted by hand, leaving a hole through which the sausage may be inserted.

Manufacturing Corn Sugar

Charles R. Brown, Kansas City, Mo., and H. E. Nelson, Keokuk, Ia. No. 1,690,359. Nov. 6, 1928.

A process of manufacturing corn sugar or glucose from corn resulting in exceedingly pure end products. Heretofore the process of manufacture has been one involving a prolonged steeping of the corn in tubs in a solution consisting of a sulphurous acid-water bath for a period of from 50 to 60 hours until the hulls have softened sufficiently. During the steeping process, considerable quantities of iron were dissolved from fixtures in the steeping tubs, which were sufficient in amount to combine with the phosphates of the corn kernels to give an insoluble substance that was extremely difficult to remove. Purification consisted in a prolonged treatment to get rid of the iron phosphates.

By the new process practically 100 per cent yield of starch is obtained in a form in which there are no insoluble iron compounds. The corn is first steamed, then cracked in a de-germinating mill, following which the corn grits are separated from the germs. The corn grits are then steeped for a short time in 0.03 per cent acid-water bath at a temperature of between 120 deg. F. and 130 deg. F. The period of time is between 6 and 12 hours, and the acidity is so low that practically no iron is taken up from the steeping tubs. The grits may now be washed and used for starch manufacture or may be run into the convertors and then formed into glucose.

Macaroni Die for Making "Juliet"

Mario Tanzi, Boston, Mass. No. 1,685,249. Sept. 25, 1928.

A die for macaroni presses which causes the dough to be extruded in waving folds attached on opposite sides of a central rib or "backbone."

Process of Preserving Beverage

F. J. Andress, Cincinnati, Ohio, assignor by mesne assignments to the Brownie Corporation, N. Y. No. 1,691,538. Nov. 13, 1928.

A process for preserving food and beverage products in which milk is one of the components. In milk beverages in which chocolate or cocoa are present there is a tendency to separate under certain unfavorable conditions, which, the inventor claims, is due to traces of acid that may result either from the hydrogen peroxide treatment or which may naturally be present in the substance. The invention is a further amplification of his patent No. 1,497,657, June 10, 1924, in which hydrogen peroxide is used to destroy the bacterial organisms in the milk. In the present patent he proposes to treat the milk beverage with hydrogen peroxide at a temperature of 120 deg. F., at which it is alleged to be in a very active germicidal condition. It appears that, as the temperature of the product rises, hydrogen peroxide does not become active as a germicidal agent until a temperature of 100 deg. F. is reached, but it becomes very active at a temperature of 128 deg. F. Higher temperatures render it still more active, but the parallel decomposition and changing of flavor of the food render it undesirable to use temperatures above 128 deg. F. A temperature of 140 deg. for one-half hour will sterilize milk containing between 56 and 160 c.c. of 3 deg. O.S.P. hydrogen peroxide, but a certain amount of acidity seems to form which must be neutralized to protect the product. Andress recommends sodium hydroxide which also will destroy any remaining traces of hydrogen peroxide.

Process of Coating Fruits

E. M. Brogden, Santa Monica, Calif., assignor to Brogex Company, Winterhaven, Fla. No. 1,692,286. Nov. 20, 1928.

An apparatus for coating fruits with a mixture of paraffin and oil of the type known as white oil or medicinal oil. The purpose of the waxy coating is to prevent withering and infection and preserve the freshness of the fruit.

Decorticating Cereals

Worthy Lee, Council Bluffs, Ia. No. 1,693,847. Dec. 4, 1928.

A machine is described in which kernels of grain are rubbed and scoured against each other in such a manner as to loosen and detach the fibrous epidermal layer without removing any of the underlying layers of gluten or protein material. By the preliminary removal of these outer layers, which contain coloring and mineral matter, a larger amount of high-grade flour may be produced from wheat and a smaller amount of low-grade flour, shorts, brans, and other byproducts of milling.

The preparation of the wheat for the decorticating process consists in wetting the grain by immersing in water five to ten minutes before the grain is to enter the machine. This is a sufficient time to moisten and toughen the fibrous epidermal layers without allowing an appreciable amount of moisture to be absorbed by the underlying hard gluten layers.

Smoke Box

J. E. Covey, Chicago, assignor to Swift & Company, Chicago. No. 1,694,163. Dec. 4, 1928.

A smoke box is described for producing smoke in smoke houses which will prevent the escape of soot and ashes into the smoke house and settling onto the meat. The apparatus involves a self-heating device for filtering the soot and ashes from the smoke which pass upwardly through the smoke tube into the smoke room. The fuel is the sawdust itself.

Vegetable Peeling Machines

Claude McCathron, Rochester, N. Y., assignor to Josiah Anstiece & Co., Inc., Rochester, N. Y. No. 1,687,171. Oct. 9, 1928.

An improvement over the older type of rotary vegetable peeling machine, in which the peeling is accomplished by the abrasive action of the sides and bottom of the vessel. The improvement is accomplished by having undulations in the bottom of the peeler, of such a type that vegetables are circulated outwardly across the bottom, upwardly toward the top, and down the center of the mass.

· WHAT'S · ON · YOUR · MIND? ·

An open forum for the exchange of opinion

"Reach for a Sweet"

To the Editor of "Food Industries":

The following is a copy of a notice posted in all the factories of the American Caramel Company, and the R. E. Radda Candy Company: "The makers of Lucky Strike Cigarettes, in their advertisements, are telling the people to smoke instead of eat candy. Any influence that this may have will be directly reflected in less candy sales and, naturally, in less work for candy makers.

"Of course, one way to have this advertising discontinued would be for all candy makers to discontinue smoking Lucky Strike Cigarettes and influence their friends to discontinue them also.

"However, we believe that the National Confectioners Association will not resort to such methods, but will use an 'educational' program to the public instead, to combat these advertisements."

AMERICAN CARAMEL COMPANY,
William D. Himes, General Manager.
Lancaster, Pa.

* * *

Nitrogen Canning a Failure?

To the Editor of "Food Industries":

In September *Food Industries* there was an item about "nitrogen canning" experiments being conducted at Hammonton, N. J. While I still hold the opinion that the theory on which the test is being carried out is very unsound, I would be glad to be convinced otherwise, if there is any good reason. What has become of the experiments?

P. J. WILBURSON.
Chicago, Ill.

[No further information is available on the experiments, and the belief is growing that they have proved unsuccessful—EDITOR.]

* * *

Handling of Frozen Milk in the Dairy Industry

To the Editor of "Food Industries":

At this time of the year I receive numerous requests for information relating to the utilization of frozen milk in the dairy industry. My first interest in this subject centered around an investigation relating to the manufacture of cheese from frozen milk. At present I am studying the relationship of milk freezing to the handling of the milk for market milk purposes.

Briefly referring to the investigation dealing with the utilization of frozen milk for cheese making I wish to state that cheese equal in quality was made from frozen and non-frozen milk. Slight process modifications were required to produce an excellent quality cheese from frozen milk.

When one speaks of frozen milk in the dairy industry, the reference is to milk partly frozen. Milk in this condition is altered physically only. Freezing milk in no way decreases its healthfulness. Partly frozen milk is removed from milk cans by the aid of hot water and mechanical means. If these methods do not introduce contamination, the partly frozen milk is of a higher sanitary quality than like milk held at a higher temperature.

In the utilization of frozen milk for market milk purposes many problems present themselves. During the winter months milk is usually held in air or in water according to the severity of the weather. The freezing of tank water can be prevented by placing in the tank 15 to 50 per cent of common salt, depending upon the severity of the weather. This amount of salt does not deteriorate the metal of the cans.

When the temperature of the air is 10 deg. F. it is satisfactory to allow the milk to cool and hold in air at this temperature. Special precautions should be taken not to have the cans placed in circulating air. Milk held in this manner cools sufficiently quickly to prevent bacterial growth, and the slight ice formation in eighteen hours does not interfere with the handling of the milk. When the temperature of the air is 0 deg. F. or —10 deg. F. a considerable amount of ice freezes to the can, which involves an appreciable effort at the plant to remove the frozen milk from the can.

During sub-zero weather milk can be placed in the drained tank in the milk house. Milk should be chilled below 50 deg. F. in the air before being placed in the drained tank. The majority of covered tanks in milk houses are sufficiently insulated to prevent freezing when this plan is followed.

When partly frozen milk is pasteurized its normal creaming power is restored. In a series of experiments with Jersey milk I have found that in no test did freezing of milk influence its creaming power after pasteurization.

J. C. MARQUARDT.
N. Y. Agricultural Experiment Station.
Geneva, N. Y.

* * *

Chocolate Research in England

To the Editor of "Food Industries":

We have read the article on improved roasting methods which appeared in your interesting periodical *Food Industries* for November, and we would like to call your attention to the fact that the work done by Bainbridge and Davies on the subject of "Chocolate Aromas" was carried out in the laboratory of Rowntree & Company, of York, England, and not in the plant of Cadbury, as mentioned in your article.

G. B. AGAR,
Director The Rowntree Company, Ltd.
Toronto, Canada.

Continental Can Company Building New Factory

The Los Angeles Can Co., a subsidiary of the Continental Can Co., Inc., has let the contracts for a new plant on the Pacific Coast. This plant is being erected to provide increased facilities in that territory and will replace present leased properties. Production of the Los Angeles Can Co. consists of both packers and general line cans. Completed cost of the plant and equipment will approach $1,000,000.

Southern Dairy Merger

Merger of a number of dairy products plants in Texas, Arkansas and Louisiana, including the Producers' Milk company of Dallas, under the name of the Southern Dairy Products Company with a capital stock of $7,000,000, was announced this week by C. M. Conway of Texarkana, president of the company. Manufacture of dairy products and ice are the principal objects of the company but plans are being made to produce cheese. Headquarters are to be maintained in Texarkana, with branches in Dallas, Little Rock, Fort Worth, San Antonia and Shreveport, La.

Plants included in the merger are the Terry Dairy company of Arkansas, with plants at Little Rock, Hot Springs, Newport and El Dorado; Grisham Ice Cream company with plants at Searcy, Morrilton, and Conway, Ark.; Dixie Ice Cream company of Arkansas with plants at Pine Bluff, McGehee and Camden; Dixie Creamery company of Shreveport with branches at Lakes Charles, Bastrop, Minden and Winnfield, La., and Center, Timpson and Nacogdoches, Texas; Shaw Brothers creamery of Fort Worth with plants at San Antonio, Beaumont and Port Arthur, Texas; Campbell Ice Cream company of Shreveport, La.; Hutchinson Coco-Cola company of Magnolia, Ark.; and ice plants in Texas at Texarkana, Dallas, Oak Cliff, Fort Worth, Frost and San Antonio.

Aggregate sales of the merged concerns in 1927 totaled $4,409,000 and for the first nine months of 1928 total aggregate sales were $3,393,000.

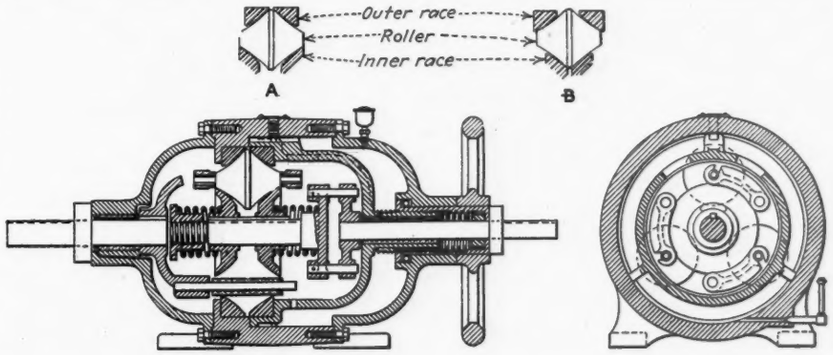
MANUFACTURERS' · NEWS · AND · EQUIPMENT

Variable Speed Transmission

Stephens-Adamson Manufacturing Co., Aurora, Ill., has recently added the J. F. S. Variable Speed Transmission to its list of products. This new device, which is no larger than the motor with which it is used, operates without gears, and is therefore noiseless. It is fully enclosed and the parts run continuously in oil. Transmission efficiency is said to be better than 95 per cent up to rated capacity. The machine has a maximum output speed of about 55 per cent of the input and a minimum of about 10 per cent. Sizes range from ½ to 15 hp. at full reduction.

The principle employed is shown in the cut. The machine may be likened to a roller-bearing in that the power is transmitted through a planetary system in which double conical rollers replace gears. The manufacturers claim that transmission losses are no greater than those in a roller bearing under similar service.

The small shaft passing through the hand-wheel is connected through a flexible coupling or through other driving means to the power source. Through



a coupling inside the casing, the power is transmitted to a central shaft upon which are keyed two disks of special shape slideably mounted and forced toward each other by heavy springs. These disks act as the inner roller race. The three rollers are so shaped as to make point contact with the inner race in all positions and similarly to make point contact with the stationary outer race. Through a hand-wheel and yoke the proximity of the two halves of the outer race may be continuously varied with limiting positions with respect to the rollers and inner race as shown at (A) and (B).

A yoke keyed to the larger driven shaft carries links which transmit the revolution of the rollers about the stationary race to the output side of the machine. It is evident that rotation imparted to the inner race is communicated as a differential revolution to the rollers and hence to the yoke. By varying the relation of the halves of the races, the contact points between races and rollers may be changed with a resultant variation in output speed.

Continental Can Company Expanding Rapidly

Further expansion by Continental Can Co., Inc., has been announced through the acquisition of the assets and business of the Bedford Can Co., of Bedford, Va., can manufacturers since 1909. The business of the Bedford Can Co. consists of the manufacture and sale of cans for various purposes, with the major portion of its business in cans used in the packing of food products. This acquisition provides Continental Can Co., with another important unit, located to serve the canning industry of the South.

Another recent acquisition is the plant, machinery and business of the Wheeling Can Company, a subsidiary company of the Wheeling Steel Corporation which was established in 1901 and owns and operates two can manufacturing plants in the Wheeling District, manufacturing a diversified line of cans. These plants have both rail and water transportation facilities available resulting in distinct advantage to the company in securing an economical distribution of its products.

Since the first of the year Continental Can Co. has practically doubled its number of operating units. Other recent acquisitions include the Passaic Metal Ware Co., the U. S. Can Co., the Seattle-Astoria Iron Works, the Southern Can Co., the New Orleans Can Co., and the can manufacturing business of R. Hardesty Manufacturing Co. of Denver. The company now operates 28 plants, widely distributed throughout the country with a present volume of business about 50 per cent greater than in 1925. Its output is approximately one-third packers cans and two-thirds general line cans for paints, oils, chemicals, coffee, and similar items.

MANUFACTURERS' CATALOGS

"Straight Facts about Straight Alkali." The Mathieson Alkali Works, Inc., 250 Park Ave., New York City.

Wholesale Price Lists, Natural Fruit Flavors, Olive Oils, Volatile Oils, Flavoscents, Certified Colors, Aromatic Chemicals, etc. Ungerer & Company, New York.

Rotary Pumps. High duty vacuum pumps, single stage high vacuum pumps, rotary air compressors, Beach-Russ gas booster, liquid power pump, bronze liquid pump, automatic vacuum pump, rotary compressor, pumps for oil burners; bulletin No. 37, Beach-Russ Company, 50 Church St., New York City.

"Advanced Dehydration of Liquids by the Dee-Hy Process." Bulletin describing the Dee-Hy process and its application to the dehydration of milk and compounds, syrups, gelatin, glue, egg, fruit and vegetable juices, products, cereals, grains, meat products, pectin solutions, yeast liquids, etc. Liquid Dehydration Corporation, 4750 Sheridan Road, Chicago.

Motors. Repulsion start, induction, single phase motors, type RS. Bulletin 2-1. Squirrel cage, induction, polyphase motors, type SC. Bulletin 7-3. Century Electric Company, St. Louis, Mo.

Engineering Information. Selection of Motors and Control. Bulletin 23-401. Loose leaf notebook data relative to single phase and three and two phase induction motors and direct current motors, polyphase induction motors. Century Electric Company St. Louis, Mo.

LaMotte Soil "Testkit," bulletin describing soil testing apparatus. LaMotte Sludge Testing Set. Bulletin describing apparatus for testing pH of sewage sludges. LaMotte Chemical Products Company, Baltimore, Md.

"The Story of the South Coast Company." A history of the development of the South Coast Company, owning 39,000 acres of sugar plantations and four sugar factories in Louisiana, giving a history of their efforts to combat mosaic disease of sugar cane. The Celetox Company, Chicago.

Wagner Distribution Transformers. Description of transformers of 500 kva., their characteristics, methods of construction, and detailed information. Also a discussion of the effect of operating conditions on transformer performance. 52 pages. Bulletin No. 160. Wagner Electric Corporation, St. Louis, Mo.

· NEWS · ITEMS ·

Standards for Ginger Ale, Sarsaparilla, and Cinnamon Extracts Announced

REVISED and amended definitions and standards for ginger ale and ginger ale flavor, sarsaparilla and sarsaparilla flavor, and for cinnamon extracts have been adopted by the Secretary of Agriculture at the recommendation of the Food Standards Committee, according to an announcement by the Food, Drug and Insecticide Administration of the United States Department of Agriculture. These definitions and standards are adopted for the guidance of officials of the department in the enforcement of the federal food and drugs act.

The text of the revised and amended definitions and standards is as follows:

Ginger ale is the carbonated beverage prepared from ginger ale flavor, sugar (sucrose) syrup, harmless organic acid, potable water, and with or without caramel color.

Ginger ale flavor, ginger ale concentrate, is the beverage flavor in which ginger is the essential constituent, with or without aromatic and pungent ingredients, citrus oils, fruit juices, and caramel color.

Sarsaparilla is the carbonated beverage prepared with potable water, sugar (sucrose) syrup, sarsaparilla flavor, and with or without caramel color. It may or may not be acidulated.

Sarsaparilla flavor is the beverage flavor prepared from oil of sassafras and methyl salicylate (or oil of wintergreen, or oil of sweet birch), with or without other aromatic and flavoring substances, and caramel color. It derives its characteristic flavor from oil of sassafras and methyl salicylate.

Cinnamon extract, cassia extract, cassia cinnamon extract, is the flavoring product prepared from oil of cinnamon, and contains not less than 2 per cent by volume of oil of cinnamon.

Oil of cinnamon, oil of cassia, oil of cassia cinnamon, is the lead-free volatile oil obtained from the leaves or bark of *Cinnamomum cassia* (L.) Blume, and contains not less than 80 per cent by volume of cinnamic aldehyde.

Ceylon cinnamon extract is the flavoring extract prepared from oil of Ceylon cinnamon and contains not less than 2 per cent by volume of oil of Ceylon cinnamon.

Oil of Ceylon cinnamon is the lead-free volatile oil obtained from the bark of the Ceylon cinnamon (*Cinnamomum zeylanicum* Nees), and contains not less than 65 per cent by volume of cinnamic aldehyde and not more than 10 per cent by volume of eugenol.

COMING EVENTS

JANUARY

2-4—Northwest Canners' Association, Portland, Ore.
3-4—Ozark Canners' Association, Fayetteville, Ark.
7—Connecticut Manufacturers of Carbonated Beverages, Bridgeport.
7-8—Pennsylvania Bakers' Association, Harrisburg.
8-9—North Carolina Ice Cream Manufacturers' Association, Wilmington.
8-9—Wisconsin Association of Ice Cream Manufacturers, Milwaukee.
8—Massachusetts-Eastern Soda Water Bottlers' Association, Boston.
8-9—Maryland Bottlers of Carbonated Beverages, Baltimore.
9—New Hampshire and Vermont Bottlers of Carbonated Beverages.
10-11—Nebraska Bottlers of Carbonated Beverages, Grand Island.
14-15—New Jersey Bottlers of Carbonated Beverages, Atlantic City.
14-16—Ohio Bakers' Association, Columbus.
16-17—New England Association of Ice Cream Manufacturers, Boston.
17-18—Oklahoma Bottlers of Carbonated Beverages, Oklahoma City.
21—Junior National Convention, American Society of Bakery Engineers, San Francisco.
21-22—Arkansas Bottlers' Association, Little Rock.
21-23—New York Bakers' Association, Buffalo.
21-25—Annual Convention, National Canners' Association, Chicago.
21-25—Annual Convention, Canning Machinery and Supplies Association, Chicago.
21-25—Annual Convention, National Pickle Packers' Association, Chicago.
21-25—Annual Convention, National Food Brokers' Association, Chicago.
23-24—Pennsylvania Association of Dairy and Milk Inspectors, Harrisburg.
24-25—Alabama Association of Ice Cream Manufacturers, Decatur.
24-25—Missouri Bottlers of Carbonated Beverages, Jefferson City.
28-29—Texas State Bottlers' Association, Dallas.
29-30—Ohio Association of Ice Cream Manufacturers, Youngstown.

FEBRUARY

4-5—Tennessee Association of Bottlers of Carbonated Beverages, Chattanooga.
6-7—California Bottlers' Protective Association, Los Angeles.
7-8—Alabama Bottlers' Association, Birmingham.
11-12—Mississippi Bottlers' Association, Gulfport.
11-12—Kentucky State Bottlers' Association, Paducah.
11—Michigan Allied Dairy Associations, Kalamazoo.
11-13—Indiana Bakers Association, Indianapolis.
13-14—North Dakota Bottlers' Association, Jamestown.
14-15—Washington State Bottlers' Association, Seattle.
14-15—West Virginia Bottlers' Association, Charleston.
19-21—Cake Conference, American Bakers' Association, Chicago.
20-21—Ohio Bottlers' Convention, Columbus.
22-23—Utah State Bottlers of Carbonated Beverages, Ogden.
26-27—Colorado Bottlers of Carbonated Beverages, Canon City.

MARCH

6-7—Michigan Bottlers of Carbonated Beverages, Grand Rapids.
13—Dairy Products Association of Kentucky, Louisville.
18-21—National Convention, American Society of Bakery Engineers, Chicago.
26-28—Kansas Bakers Association, Wichita.

University of Pittsburgh to Make Meat Packaging Study

An investigation which will be of interest to all concerned with the merchandising of packaged goods has been undertaken by the University of Pittsburgh through its Bureau of Business Research. Consumer preferences for packaged meats will be studied in the Pittsburgh trade area, for the purpose of determining both the choice of the consumer for packaged as against bulk goods, and also the preferences for various types of containers, including paper, wood, metal and glass

The survey will be made under the direction of Dr. John H. Cover, director of the bureau, and will have the cooperation of the Institute of Meat Packing of the University of Chicago. The study is being made because of the rapid development of packaging in the meat industry and the desire to establish a basis of consumer preferences for further developments along this line.

The work is being financed through a grant made by *The National Provisioner*, Chicago, and is known as The National Provisioner Package Survey.

California Fruit Co-operatives Merge

A merger, culminated in San Francisco on December 10, joined the interests of the Sun-Maid Raisin Growers' Association and subsidiaries, the Sutter Cooperative Growers, Inc., the California Peach and Fig Growers' Association, the California Prune and Apricot Growers' Association, the Rice Growers' Association of California, and the Canning Fruit Growers.

Through this merger, the production of 35,000 fruit growers and processing and marketing equipment valued at millions, together with a large personnel of the various participating organizations, are made available for handling a large part of the non-citrus fruit production of California. The use of the world-advertised Sun-Maid brand will be extended to include apricots, peaches, prunes, rice and figs and the marketing organization is to carry on a campaign with the object of extending the sale of these fruits to world markets in order to stop the price decline due to surplus production.

The Sun-Maid Corporation with its nine manufacturing plants and 34 crop receiving stations, becomes one of the largest food distributors in the world. The canning industry gains foreign and domestic trade outlets while the fruit growers gain a lowered sales cost, a uniformly increased demand and better

markets. A more complete line of California products is to be marketed under one name. Processing facilities are rendered more flexible with respect to raw material supplies, and a large volume buying power, with consequent savings, is attained. This will vitally affect such things as containers, sugar, and other commodities used in the processing. Competition is eliminated to some extent.

The Canning Fruit Association will can peaches at its five plants for the Sun-Maid label. At the same time, the standard labeled products already being marketed by the various parties of the merger will be continued and in addition all products will be marketed under the Sun-Maid labels. Sun-Maid now processes and packs about half of the 250,000-ton raisin crop of California and will process the entire output of the California Peach and Fig Growers' Association, together with a part of the output of prunes, rice and apricots of the other members. The Sun-Maid selling organization is actively represented by staff members in many parts of Europe and Asia and has 17 division officers in North America with sales staffs in 117 cities.

Sprague-Sells Corporation Consolidates with John Bean Manufacturing Company

A new consolidation of canning equipment manufacturers was announced December 1 when the Sprague-Sells Corporation joined with the John Bean Manufacturing Company. The latter organization is a recent consolidation of the Bean Spray Pump Company of San Jose, Calif., and Lansing, Mich., with the Anderson-Barngrower Manufacturing Company of San Jose.

The consolidation of these three large companies is expected to effect many economies, such as a single sales force, and more economical mechanical servicing of equipment as well as clearing away pending patent litigation, and improving manufacturing facilities. The eastern canning machinery business will be known as the Sprague-Sells Division of John Bean Manufacturing Company and its offices, factories and representatives remain unchanged.

Chemists and Engineers Form Association

Association of Consulting Chemists and Chemical Engineers, Inc., New York City, has been chartered by the secretary of state as a membership corporation without capital stock. The objects of the association are to advance the science and practice of consulting chemistry and chemical engineering, to improve the service of the profession and to assist in the dissemination of useful information to its clients, to the public and to all branches of the government, etc., and to own and operate buildings, laboratories, instruments, equipment and facilities for the members in the practice of their profession.

Dr. Hal T. Beans, Dr. Irving Hochstadter, Clarence V. Ekroth, Jerome Alexander, Albert G. Stillwell, John Morris Weiss, Albert M. Smoot, Robert Schwarz, Dr. Arthur W. Thomas, Dr. Frank C. Gephart, Charles V. Bacon are the incorporators.

Beverage Bottle Simplification Committee Named

A committee of men representing bottlers and bottle manufacturers has been named to work under the U. S. Department of Commerce plan for simplification of sizes of beverage bottles. This is one of the results of the industry conference held in August which decided that there was a real need for simplification in sizes, capacities, heights, etc., amounting to a dimensional simplification. Of the nine members named, the first five listed below represent the beverage industry and the last four the glass container industry. The first work of the committee will consist of a survey of the industry to determine what is the present bottle size practice in order that further recommendations may be based as largely as possible on present size standards. The committee named is: James Vernor, Jr., of American Bottlers of Carbonated Beverages, Chicago, Chairman; Junior Owens, of American Bottlers of Carbonated Beverages, Washington, D. C.; Carl A. Jones, President, American Bottlers of Carbonated Beverages, Bristol, Virginia; Charles E. Culpepper, New York City; Frank L. Lloyd, Crown Cork and Seal Company, Baltimore, Md.; W. S. Richards, Illinois Glass Company, Alton, Ill.; J. P. Curran, American Bottle Company, Toledo, Ohio; L. S. Cunningham, Jr., D. C. Cunningham Glass Company, Pittsburgh, Pa.; and William R. Root, Root Glass Company, Terre Haute, Indiana.

Xylose Factory

The rare sugar, xylose, now selling for $100 per lb., may soon be marketed at a price of less than $1 per lb., when the new factory at Anniston, Ala., is in production. The U. S. Bureau of Standards, co-operating with the Alabama Polytechnic Institute, the University of Alabama, and the Alabama Industrial Development Board, has undertaken the erection of an experimental plant to manufacture 100 lb. daily from cottonseed bran and peanut hulls.

The uses of xylose, outside of bacteriological laboratories, is very restricted at present because of its high price, but with larger supplies available new uses will be sought. Considering the great amounts of available materials from which xylose may be made, such as brans, corn stalks, corn cobs, and the like, this development bids fair to be an extremely interesting one.

Americans Invited to Advise Germany on Agriculture

An American commission of ten members, invited by interested German economic groups to make a survey, in the summer of 1928, of the agricultural situation in Germany, especially with regard to dairy products and marketing of meat, spent three months in Germany, in study, travel, and discussion of facts and possibilities. This report, in German translation, is soon to be published. A summary of the somewhat unexpected findings of the commission, as far as they are of interest to readers of *Food Industries*, will be given as soon as the report is released in Germany.

Van Camp Sells Its Milk Plants

Announcement of the sale of the eight milk evaporating plants of the Milk Division of the Van Camp Packing Company, Incorporated, to the newly formed Van Camp Milk Company, was made on December 19. The combined production of more than 2,000,000 cases of evaporated milk annually is to be sold through the Van Camp Products Company, a selling subsidiary. All of the common stock of the Milk company except the director's qualifying shares is to be held by the Packing company.

Powdered Milk Plant for Texas

Establishment of a powdered milk plant to be followed by an evaporating unit at Waco, Tex., by the Borden company of New York will be started immediately, following a promise made by Borden Milk company officials to the Chamber of Commerce of Waco. Use of about 50,000 lb. of milk daily is planned at the opening of the plant, but as the dairy herds are enlarged it is planned to increase production of the plant to include all products of the Borden Milk company. Six counties about Waco will contribute to the milk supply.

Agricultural Opposition to Cooking Compounds

The National Grange is requesting Congress to extend the provisions of the Oleomargarine Act to cover the so-called cooking compounds, made of hydrogenated coconut and peanut oils, which are now being manufactured and sold as substitutes for butter. The Grange contends that such cooking compounds are "flagrant imitations of butter" and should be brought under the control of the Internal Revenue Bureau in the same manner as the products known as oleomargarine are handled.

Possible Tariff Revisions Affect Many American Producers

By Paul Wooton
Washington Correspondent

VEGETABLE OILS, dairy products, rice, vegetables, fruits, canned goods, meats, poultry, fish, and cocoa are the items of the tariff act of interest to the food industries around which principal interest is revolving.

It is recognized that no such favorable opportunity ever before has been presented to secure increased tariff rates on food products. In addition to the general declarations in favor of the policy of using the tariff to protect American industries now endorsed by the Democratic party, by labor, and by other influential groups that will not benefit directly from increased rates, the new administration is committed by the party platform to reserve the domestic market for the American farmer. About the only interests that are sounding notes of warning in this connection are the bankers and the wholesalers. It is anticipated, however, that the item-for-item consideration of the tariff bill will reveal that there is much more opposition to most of the proposed increases than is now apparent.

The tariff situation is complicated by the fact that so many of the great consuming centers are on the seaboard, where imported goods have the best opportunity to compete. When the rate is made high enough to reduce imports materially at those points, a higher rate is really made operative against the interior of the country.

Vegetable Oils and Dairy Products

Representatives of the producers of domestic vegetable oils are seeking actively the revision upward of the rates of duty now prevailing. This is being resisted by the representatives of the consumers of the imported oils. On behalf of this latter group it is contended that industrial consumers should not be forced to use edible oils for industrial purposes. They argue that it is not in the public interest to put prohibitive duties on the imports of the low-grade industrial oils which they use. They claim that the existing duty of two cents per pound on cocoanut oil is prohibitive and effectually prevents the entry into this country of any foreign cocoanut oil. At present all requirements of this important commodity are drawn from the Philippines. Agriculturists in continental United States, however, are seeking to extend the duty to the imports from those islands.

The dairy interests are thoroughly organized and are out for substantial increases on milk, butter, and cheese. Imports of cheese are particularly large.

Rice growing has become a well-intrenched domestic agricultural industry. A vigorous effort will be made to secure a higher rate and to get a specific definition of broken rice into the new law. Increases also will be asked for rolled oats, prepared breakfast foods, crackers, and biscuits.

Producers of domestic fruits and vegetables constitute another group in a position to make its influence felt. The desire to keep Florida in the Republican column, together with the political influence of California, means that increases desired by those states are certain to receive sympathetic consideration. The suggestion, however, that a duty be placed on bananas on the ground that they displace domestic fruits and foods is not meeting with great favor on Capitol Hill. It is pointed out that the duty would be of little value for those purposes unless it was high enough to cause a marked increase in the retail price of bananas. To accomplish this a duty of fifty cents or more per bunch would be required. As bananas constitute a large proportion of the fruit consumed in this country, it is recognized that no high rate could muster the votes necessary to put it through. More than 67,000,000 bunches of bananas were imported in 1927.

Canned Goods and Tomato Paste Likely To Be Protected

The large volume of canned goods that continues to come into the country under present rates of duty is expected to influence the committee to recommend higher rates for these commodities. This is particularly true of tomatoes. Under the present 15 per cent ad valorem rate there have been large imports. The fact that tomato paste was made dutiable at forty per cent has not been effective, as the low-acid Italian tomatoes have been brought in and paste made in this country. As Western tomatoes have practically the same properties as those raised in Italy, it will be argued that the large demand for tomato paste should be met from domestic sources.

Large importations of turkeys from Argentina, Austria, and Russia led to the belief that there will be a strengthening of the paragraph providing 6c. per pound on poultry. An effort also will be made to increase the rate on egg products. The duty of 18c. per pound on dried eggs has not been greatly effective in reducing imports from China.

The new impetus which has been given the fish industry by the quick freezing process has increased the demand for the production of those products. Under the present duties it has been possible on occasions for foreign producers practically to dominate the domestic market for certain types of fish.

Changes in the spice paragraph will be sought so as to permit the building up in this country of a larger industry in the preparation of these products. This is held to be advisable also for the reason that it is difficult to determine the content of prepared spices and to know whether or not they have been prepared under sanitary conditions. If the duties on raw materials were lowered, it is contended, and those on the prepared products increased, practically the entire industry engaged in spice preparation for use here could be transferred to this country. A fight also is scheduled on the chocolate and cocoa paragraphs.

Canners Urge Identification of Substandard Grades

A bill to require the labeling of canned food falling below standards fixed by the U. S. Department of Agriculture was introduced by Senator C. L. McNary on Dec. 11 and is now before the Committee on Agriculture and Forestry. The purpose is not to set up classified grades, but to draw a dead line for each product, foods falling below this minimum to be conspicuously labeled. All classes of food packed in hermetically sealed containers and sterilized by heat are included with the exception of meat products and milk, which are controlled by existing legislation. The bill, which constitutes an amendment to Section 8 of the basic Food and Drugs Act of 1906, was drafted and is being urged by the National Canners Association. It is stated that the present sale of inferior products without means for the consumer to identify them as such not only reacts against the general public but retards any large-scale advertising planned by the canners.

Federal Measure Provides for Inspection of Poultry

Stringent inspection of poultry products is provided in a bill introduced by Congressman C. F. Lea, of California. The purpose and wording of the bill are similar to those of the meat-inspection act already in force. It is understood that the Bureau of Animal Industry would conduct the service, as in the inspection of meats, to prevent the use of unhealthful poultry products in interstate commerce. The certification of canned poultry and of turkeys now being carried on by the Bureau of Agricultural Economics is believed to be a temporary measure which would be absorbed in the organization built up under the Lea bill. All interests concerned seem to be in favor of the bill's passage, conditions through the trade being such that need for regulation is generally felt by producers as well as consumers.

Aside from the optional service as to turkeys and canned goods, federal inspection covers live birds only. As a result, quantities of unfit poultry products have been coming into the market, as shown by the rejection of large consignments by the New York health authorities. The unfavorable publicity attending this action has caused a sharp decline in New York demand, it is stated. Nation-wide inspection is seen as the logical means to restore general

confidence, correct abuses, and prevent large losses to wholesalers.

The Produce Agency Act to suppress unfair practice in the marketing of perishable commodities is to be greatly strengthened if the fresh fruit and vegetable licensing bill offered by Senator Borah, reported by Senator McNary, and now on the Senate calendar is finally accepted. The present act, which has been applied to a number of cases during the past year, is aimed at fraud and deception by an agent dealing in perishable farm products. When investigators of the Department of Agriculture are satisfied that prosecution should be made, the evidence is submitted to the Department of Justice and the U. S. District Attorney of the jurisdiction concerned then handles the case. The new bill proposes the licensing of everybody who buys and sells such commodities in carload quantities for interstate commerce and makes the Department of Agriculture the regulatory body. Action of the Department against unfair practices would then be similar to that of the Federal Trade Commission with the added power of control over individuals as well as corporations. The right given to revoke licenses, it is pointed out, would put teeth in a cease-and-desist order or settlement instructions.

Honey Exports to Germany Require Careful Processing

German restrictions against overheated honey have been causing concern among American producers. More than eight million pounds per year, or roughly two-thirds, of American honey exports go to Germany, to be used not only for table purposes but also in various distinctively national confections and bakery products. It has been extensively advertised as a health food. Consequently, Germany has attempted to develop domestic sources and to discourage imports. It is understood that propaganda to the effect that American honey came in unsanitary containers was circulated to some extent, but it had little force because it was unfounded. German production is rapidly falling off, it is reported, notwithstanding the high demand.

Large shipments from the United States have recently been refused as "adulterated" on the grounds that diastase. one of the enzymes found in honey, had broken down as a result of heating over 140 deg. F. Heating is usually resorted to for purposes such as extraction, straining, and prevention of granulation before sale. Diastase is not considered important from the viewpoint of food value, but may be taken as an index of overheating, which injures the flavor and color of honey. American interests are seeking to avoid refusals by more careful processes and by analysis of consignments before shipment.

Refined sugar entering Germany must pay a duty of 25 reichmarks per 100 kilos. The advance from 15 reichmarks became effective December 18.

Undulant Fever Due to Drinking Raw Milk

At the recent meeting of the American Public Health Association in Chicago several papers were presented which stressed the increasing importance of an animal disease that is transmissable to man through the drinking of raw milk. Milk-borne typhoid fever seems to be decreasing in importance and it is possible that undulant fever may increase sufficiently in importance to occupy the place now occupied by the former. Measures for its control were discussed.

Soft Pork Elimination Studies

Definite conclusions are being reached by co-operative researches involving the U. S. Department of Agriculture, and thirteen agricultural experiment stations as to proper ways of feeding hogs to avoid the production of soft instead of hard pork. It has been found that softening feeds, such as soy beans, will produce firm carcasses, in 70 per cent of the cases, if hogged down with corn by pigs that weigh more than 125 lb., and make an average gain of 1½ lb. daily.

Mineral Oil Prohibited in Foods

Products containing mineral oil may not be labeled or sold as foods, according to a recent announcement of the Food, Drug and Insecticide Administration. Mayonnaise or salad dressings containing mineral oils, declared as substitutes for fats, are ruled to be adulterated, and if their use is to be for cure or prevention of disease they must be labeled as drugs.

In order to counteract adverse publicity, the National Association of Sugar Mill Owners, of Cuba, has named a commission to begin counter-propaganda, and to defend their interests in Washington.

AS MAY safely be assumed at the inception of a new journal, the editors of *Food Industries* will welcome contributed articles of an appropriate sort.

Also, and especially, will they be glad to receive their full quota of the less extensive and somewhat informal communications that come naturally and in generous volume to established periodicals, and concern such things as:

—new or improved machinery, described by operating men in the industry or in related industries;

—the use of materials in ways differing from the custom, either as to proportions or product;

—personally developed betterments in plant equipment or practice that might qualify for inclusion among Practical Operating Details;

—new types of packaging;

—news items of a commercial or personal nature.

For such contributions as are published and that seem to be of constructive service to the readers of *Food Industries* adequate payment will be made.

Happiness Candy Merges With United Cigar Stores

The expected merger of Happiness Candy Stores with United Cigar Stores took place in December, when holders of shares of Happiness common stock exchanged five shares for one share of United Cigars common stock. The deal had been expected because C. A. Whelan, chairman of the board of the Happiness Company, is also chairman of the board of the Tobacco Products Company, which controls United Cigar Stores.

Sweet Chocolate Is Candy

Sweet chocolate was defined as candy and not a food by the Federal District Court of Philadelphia in a suit for refund of excise taxes amounting to $4,495,525 plus interest by Hershey Chocolate Co., Hershey, Pa.; H. O. Wilbur & Sons, Philadelphia, Pa.; Ulein Chocolate Company, Elizabethtown, Pa.; and York Chocolate Company, York, Pa. The tax had been paid under protest.

Directors of the Coca Cola Company, following the approval of stockholders, voted to issue a 100 per cent stock dividend, of new Class A shares.

Powdered Pectin Makers to Continue Business

Recent interesting announcements by the National Pectin Products Company of Chicago indicate that they hold the opinion that the victory of Certo Corporation over Armour and Company is not applicable to manufacturers nor users of powdered citrous pectin. They specifically agree to indemnify users of their pectin from any and all claims for profits, damages, costs and attorney fees if the use of their pectin is adjudged to infringe patents No. 1,082,682; No. 1,235,666; or No. 1,304,166 and to defend their customers in any actions arising from the use of their powdered pectin where evaporation is required to produce a jell action.

Gold Dust Corporation Buys Standard Milling Company

Gold Dust Corporation has purchased 40,000 shares of the common stock of Standard Milling Company. The latter company owns Hecker-Jones-Jewell Company, Northwestern Consolidated Milling Company, Duluth-Superior Milling Company, Southwestern Milling Company, Standard Milling Warehouse Corporation, Standard Milling Company of Canada, Ltd., and Hecker H-O Milling Company.

Gold Dust Corporation recently acquired the American Linseed Oil Company and its sudsidiary, Best Foods Company.

Handy Chocolate Company Wins I. C. C. Case

Reparations, on account of unreasonable rates charged for transportation of numerous carloads of chocolate coating from Oak Street, Mass., to Baltimore, Md., were ordered paid to Handy Chocolate Company by B. & O. R.R. et al. in an order recently issued by the Interstate Commerce Commission. The amounts range from $84 to $2,500.

Sulphur Dioxide Refrigeration Cars

The Atlantic Coast Fisheries Company, of New York, is trying out the new refrigeration cars of the Safety Refrigerator Car Company in which the temperature is maintained at 15 deg. F. by the use of sulphur dioxide. On trips inland during hot weather the temperature varied only two degrees. Frozen fillets were maintained in their solid condition until delivered.

Dry Ice Contract

The Dry Ice Corporation, manufacturers of solid carbon dioxide for refrigeration, has contracted for chemically pure carbon dioxide gas in large amounts from the Carbide & Carbon Chemicals Corporation.

National Biscuit Buys Shredded Wheat Company

The majority of the stock of the Shredded Wheat Company has been acquired by the National Biscuit Company, according to an announcement issued at Niagara Falls by Alexander J. Porter, president. It is understood that the purchase was arranged by exchanging shares on the basis of two shares of Shredded Wheat stock for one share of National Biscuit stock. Treasury stock of the Biscuit company is to be used for this purpose.

Honey Merger

Preserves and Honey, Inc., a Brooklyn firm, has taken over the bottling business of a number of prominent honey packing companies including A. I. Root of Medina, Ohio, sellers of the Airline brand; Hoffman & Hauck of Wood Haven, N. Y.; C. H. Weber of Cincinnatti; A. L. Boyden of Los Angeles; and others. Bottling is an important phase of the honey industry. It is understood that the merged concern has ample financial backing and is about to launch a national advertising campaign to promote general demand for honey. The company is also said to be extensively interested in preserves.

Armour Settles with Certo

Officers of the Certo Corporation of Rochester announce that a substantial cash settlement has been made by Armour and Company which marks the closing chapter in the long litigation instituted by Certo Corporation against Armour and Company "for infringement of their patents covering the manufacture of concentrated fruit pectin, and its use in the manufacture of jams, jellies and conserves by what is commonly known in the trade as the 'Short Boil Process.'"

Carbon Dioxide Producers to Merge

Need of additional producing capacity, prompted by the greatly increased demand for carbon dioxide for newly discovered technical uses, is explained as the basis of the offer of the Liquid Carbonic Corporation to purchase the assets of the General Carbonic Company, subject to approval of counsel. The directors of the General company have accepted and are now placing the offer before the stockholders.

A. & P. Tea Company Loses Trade Mark Appeal

Holding that the Great Atlantic and Pacific Tea Company's appeal from the decision of the examiner of interferences relative to the use of the notation "Quaker Maid" brings up points that have been raised too late, Assistant Commissioner of Patents Moore affirmed the decision of the examiner. The Worden Grocer Company, defendant, was adjudged entitled to the use of the trade mark.

PERSONALS

Dr. T. B. Osborne Receives Gold Medal

The Thomas Burr Osborne gold medal of the American Association of Cereal Chemists, established in 1926 and named in honor of Dr. Thomas B. Osborne, of the Connecticut Agricultural Experiment Station, "as a commemoration of his notable services to cereal chemistry," was presented for the first time at the annual convention of that association, the recipient being the person for whom the medal is named. It is intended that this medal shall be awarded only for unusually meritorious contributions to cereal chemistry. In connection with the presentation, C. B. Morison, of the American Institute of Baking, gave a review of Dr. Osborne's forty years of sustained research in biochemistry, more especially in the field of plant proteins. The medal was presented by President Leslie R. Olsen. As Dr. Osborne was unable to attend the cenvention it was received on his behalf by Dr. Carl L. Alsberg, of Stanford University.

WALTER P. CHRYSLER has been elected a director of the Postum Company, Inc.

E. B. FILSINGER has been elected a director and vice-president in charge of foreign sales of Royal Baking Powder Company.

A. C. MONAGLE has been elected a director and vice-president in charge of domestic sales of Royal Baking Power Company.

NEHI CORPORATION has elected four new directors, as follows: Meredith C. Jones, Oliver J. Anderson, Sherman Woodward, and John E. Rovensky.

COLONEL J. R. SIMPSON, president of Cuba Cane Sugar Corporation, has been elected a director of the Second General American Investors Company, Inc.

H. L. HUNTER, assistant treasurer of the Glass Container Association and secretary of the standardization committee, has resigned to join the sales department of the Phoenix-Hermetic Company, Chicago. Mr. Hunter will be connected with their Brooklyn office.

DR. R. C. SHERWOOD, Director and Chemist of the Minnesota State Testing Mill, and C. W. Ingman, Chief Chemist for Minnesota Grain Inspection, have resigned their respective positions to engage in a commercial laboratory business which is to be known as the Sherwood-Ingman Laboratories, and will be located in Minneapolis.

NELSON A. CRAWFORD, for the last three and a half years Director of Information in the Department of Agriculture, has resigned to become editor-in-chief of the *Household Magazine,* published by Senator Arthur Capper at Topeka, Kan.

DR. CARL R. FELLERS has resigned from the Department of Horticultural Manufacturers of the Massachusetts Agricultural College Amherst, Mass., to become research chemist for the Hills Brothers Company, of New York. Doctor Fellers will be located at the Brooklyn factory.

DR. H. E. VAN NORMAN, formerly president of the American Dry Milk Institute, Chicago, has resigned to join the Borden Company in New York. He will be in charge of co-ordination of research, beginning Jan. 1, 1929.

WILLIAM B. WARD returns to the presidency of the Ward Baking Corporation, succeeding George B. Smith. Mr. Ward was formerly president, but became chairman of the board in 1925. Mr. Smith has resigned to be able to devote more attention to his other interests.

FRANK A. PAGE, president of International Equipment Company, manufacturers of candy machinery, died in Springfield, Mass., on December 19, aged 64. He began business in 1891 by organizing the Confectioners' Machinery and Manufacturing Company which was reorganized and called the National Equipment Company in 1900.

DR. H. B. MCDONNELL, chemist in animal pathology at the Maryland Agricultural Experiment Station, was elected president of the Association of Official Agricultural Chemists at the annual meeting held in Washington on October 29, 30 and 31. He succeeds Dr. Oswald Schreiner, chief of the division of soil fertility of the Bureau of Chemistry and Soils, who presided at the meeting.

FRANK R. WHARTON, until recently president of Allied Packers, Inc., was appointed ancillary receiver for that company in Chicago by Federal Judge James H. Wilkerson. He was also appointed receiver in equity in Detroit, where the largest plant of Allied Packers is located. The receiverships are a part of the steps in reorganization of the company and its consolidation with Hygrade Food Products Corporation of New York.

DR. EDWARD FRANCIS of the U. S. Public Health Service is ill with Malta fever in the Naval Hospital in Washington. The disease was contracted in his laboratory, where he has been experimenting with it for a number of years. Malta fever is a disease of cattle that may be contracted by humans. The course of the fever is usually from three to five years, during which period it runs in waves followed by periods of apparent recovery; hence the name "undulant" fever is also applied to it. Pasteurization will kill the organism in milk.

OBITUARY

WILLIAM SEARBY, vice-president of American Factors, Ltd., died in Honolulu, December 14, at the age of 56. He was one of the foremost sugar technologists of Hawaii.

HERBERT B. COLLINS of Swift & Co., Chicago, died December at the American Hospital in Paris after an illness of three weeks. Mr. Collins had been travelling abroad for his health.

WILLIAM A. MOORE, director of Royal Baking Powder Company, American Maize Products Company and several other corporations, died December 12 at St. Lukes Hospital in New York, after an illness of six weeks caused by an infection of the spinal cord. He was 55 years old.

JOHN B. JOHNSTON, inventor of the Johnston sieve bolt for flour milling, died at Neenah, Wis., December 3, at the age of 87. Mr. Johnston was the inventor of many processes in the milling of flour but practically none of them was ever patented by him, although it is reported that others made fortunes from his ideas.

· NEW · CONSTRUCTION ·

Factory and Equipment Requirements

Bakery — Brown's Bread, Ltd., 462 Eastern Ave., Toronto, Ont., plans the construction of a bakery at Hamilton. Estimated cost $150,000. Architect and engineer not selected. Bakery ovens and equipment will be required.

Bakery—General Baking Co., 420 Lexington Ave., New York, N. Y., is having revised plans prepared for the construction of a bakery at Georgia Ave. and W St. N.W., Washington, D. C. Estimated cost $200,000. C. B. Comstock, 110 West 40th St., New York, N. Y., is architect.

Bakery—Corp., L. Gottlieb, 10 Ave. O, Brooklyn, N. Y., awarded contract for the construction of a bakery at 86th St. and Bay 17th St. to Prospect Construction Corp., 10 Ave. O., Brooklyn. Estimated cost $40,000.

Bakery—F. C. Hoehler, Security Bldg., Toledo, O., awarded contract for a 2 story, 143 x 143 ft. bakery on Wolcott Blvd. to J. H. Berhebile, Whittier St., Toledo. Estimated cost to exceed $200,000.

Bakery—D. Perlman, 813 Allerton Ave., New York, N. Y., will build a bakery at White Plains Rd. and Mace Ave. E. R. Gottlieb, 400 East Tremont Ave., New York, is architect. Work will be done by separate contracts.

Bakery—Rawson St. Realty Co., c/o S. B. Thomas Bakery Co., Queens Blvd., Long Island City, N. Y., plans the construction of a 2 story, 80 x 80 ft. bakery at Queens Blvd. and Rawson St. Estimated cost $25,000. Private plans.

Bakery—Santa Fe Ave. Pie Bakery, H. Kemple, 521 North Santa Fe Ave., Pueblo, Colo., is having plans prepared for the construction of a 3 story, 100 x 100 ft. bakery. W. DeMordaunt, 739 First National Bank Bldg., Pueblo, is architect.

Bakery—Speck Baking Co., 7505 Grace Ave., Cleveland, O., awarded contract for a 1 story, 68 x 75 ft. bakery to J. Sweistal, 4472 Pearl Rd., Cleveland. Estimated cost $40,000.

Bakery—Western Baking Co., 5th and J Sts., Sacramento, Calif., awarded ocntract for a 2 story, 50 x 75 ft. bakery to Lindgren & Swinnerton, California Life Bldg., Sacramento, Calif. Estimated cost $40,000.

Bakery Addition—Purity Bakeries Corp., 711 South 10th St., Newark, N. J., will receive bids about Jan. 4 for a 3 story addition to bakery at 711 South 10th St. Estimated cost $40,000. R. H. Brown, 844 Rush St., Chicago, Ill., is architect and engineer.

Bakery and Distribution Plant—Dugan Bros., 161 Arlington Ave., Newark, N. J., is having plans prepared for a 2 story, 125 x 153 ft. bakery and distribution plant at Kamena, Murray and 6th Sts. Estimated cost $100,000. Private plans.

Bakery and Warehouse Addition—J. W. Crook Stores Co., C. L. Schauman, Secy., Guilford Ave., Baltimore, Md., awarded contract for addition to bakery and warehouse at Race and Ostend Sts., to Frainie Bros. & Haigley, 19 West Franklin St., Baltimore, Md. Estimated cost $125,000.

Beef Killing Building, Etc.—Cudahy Bros. Co., H. D. Hunt. Gen. Supt., Cudahy, Wis., awarded contract for a 1 story, 150 x 180 ft. beef killing building and tank house to Coddington Engineering Corp., 290 3rd St., Milwaukee, Wis.

Bottling Plant—Macon Coca-Cola Bottling Co., Macon, Ga., awarded contract for a 100 x 104 ft. addition to plant on Oak St. to Mangham Construction Co., Macon.

Candy Factory—Loft, Inc., 40th Ave. and 9th St., Long Island City, N. Y., awarded contract for the construction of a candy factory to Commonwealth Industries, 103 Park Ave., New York, N. Y.

Canning Plant—California Sanitary Canning Co., 1583 Industrial St., Los Angeles, Calif., awarded contract for a 1 story, 165 x 571 ft. canning plant at 4922 Long Beach Ave. to W. P. Neil Co. Inc., 4814 Loma Vista Ave., Los Angeles. Estimated cost $78,500.

Canning Plant—Los Angeles Can Co., 303 San Fernando Rd., Los Angeles, Calif., awarded contract for a 1 and 2 story, 300 x 500 ft. canning plant to Scofield-Twaits Co., Pacific Finance Bldg., Los Angeles.

Candy Factory—Sperry Candy Co., 140 Reed St., Milwaukee, Wis., awarded contract for a 5 story, 50 x 140 ft. candy factory to Breen Construction Co., 123 23rd St., Milwaukee.

Canning Plant—Los Fresnos Packing Co., c/o A. H. Fernandez, Brownsville, Tex., will soon award contract for a 1 story canning plant at Los Fresnos. Private plans.

Canning Plants—Riona Sales Co., A. M. Russ, V. Pres., Milan Bldg., San Antonio, Tex., recently organized, plans the construction of six canning plants for citrus fruits, grape juice, lime juice, orange juice, tomatoes, mustard greens, spinach, beans and other fruits and vegetables at key points along the Rio Grande border. Estimated cost $100,000 each including equipment. Private plans.

Canning and Packing Plant—Reid-Murdock & Co., S. T. Stevens, V. Pres., 314 North Clark St., Chicago, Ill., plans the construction of a 2 story canning and packing plant at Rochester, Minn. Estimated cost $100,000. Architect not selected.

Cold Storage Plant—Arkansas Cold Storage Co., C. E. Rose, Mgr., Little Rock, Ark., will soon receive bids for a 6 story cold storage plant on Rock St. Estimated cost $200,000.

Cold Storage Plant—Commonwealth Ice & Cold Storage Co., Fish Pier, Boston, Mass., awarded contract for the construction of a cold storage plant at 220 Northern Ave., South Boston, Mass. to W. T. Reed Co., 201 Devonshire St., Boston, Mass. Estimated cost $50,000.

Cold Storage Plant—Dept. of Welfare, J. E. Harper, Dir., Ninth and Oak Sts., Columbus, O., will soon award contract for the construction of a cold storage plant and kitchen at Cleveland State Hospital, Cleveland. Estimated cost $125,000. H. B. Briggs, Ohio Hartman Bldg., Columbus, is engineer.

Cold Storage Plant—Lewis Grocery Co., M. Lewis, Pres., Durant, Miss., awarded contract for the construction of a cold storage plant to O. E. Lewis Co., Inc., 853 Carondelet St., New Orleans, La. Estimated cost $50,000.

Cold Storage Plant—G. Whittaker, Montreal, Que., plans the construction of a cold storage plant at Moncton, N. B. Estimated cost $500,000. Sargent, Howard, Latourelle Ltd., 6 Craig St. W., Montreal, Que., are engineers.

Condensed Milk Plant—Borden Milk Co., C. D. Pearce, Chn. Production Dept., Waco, Tex., will build a 2 or 3 story condensed milk plant with own forces. Estimated cost $500,000. Private plans. Taking bids now on some major equipment.

Condensed Milk Plant—H. B. Quarton, Habana, Cuba, Consul, reports the construction of a condensed milk plant at Bayamo, Oriente Province, Cuba, has been authorized. Estimated cost $3,000,000. Name of firm sponsoring this project is available under reference Cuba No. 291939 by Bureau of Foreign and Domestic Commerce, Washington, D. C.

Creamery—Snowhite Creamery Co., San Angelo, Tex., will receive bids after January 1 for the construction of a 1 and 2 story creamery. Estimated cost $100,000. R. K. Hamberlin, 127-29 North Chadbourne St., San Angelo and H. I. Messick, 807 Builders Exchange Bldg., San Antonio, are architects. Machinery and equipment will be purchased.

Creamery—Louisiana State University, Baton Rouge, La., will soon award contract for a 2 story creamery. Estimated cost $40,000. Wogan & Bernard, Baronne Bldg., New Orleans, are architects.

Creamery Addition — Land O'Lakes Creameries, A. J. McGuire, Gen. Mgr., 2201 Kennedy St. N. E., Minneapolis, Minn., awarded contract for a 2 story, 100 x 130 ft. addition to creamery to Splady & Haagenson, 609 Marquette Ave., Minneapolis. Estimated cost $150,000.

Creamery Addition—Sheffield Farms, Inc., 524 West 57th St., New York, N. Y., will receive bids in January for addition to creamery at 527 West 125th St. Estimated cost $40,000. F. A. Rooke, 12 East 41st St., New York, is architect.

Dairy Plant—Oakhurst Dairy Co., c/o Cushman Baking Co., Bath, Me., awarded contract for the construction of a 1 story dairy plant on Center St. to Naugler Bros., Brunswick, Me. Estimated cost $55,000.

Distillery — British Columbia Distilleries Ltd., Sapperton, New Westminster, B. C., awarded contract for a 7 story, 134 x 155 ft. distillery to Northern Construction Co. Ltd., 736 Granville St., Vancouver, B. C. Estimated cost $152,000.

Food Products Plant — Glidden Food Products Co., 2305-11 Logan Blvd., Chicago, Ill., awarded contract for a 20 x 25 story addition to plant

Grain Elevator—Collingwood Terminals, Ltd., T. W. Foran, 805 C. P. R. Bldg., Secy., Toronto, Ont., awarded contract for the construction of a grain elevator 800,000 bu. capacity at Waterfront. Estimated cost $1,000,000. C. D. Howe & Co., 712 Whalen Bldg., Port Arthur, are engineers.

Grain Elevator — Port Commission, Seattle, Wash., is having plans prepared for the construction of a grain elevator, 1,000,000 bu. capacity, also workhouse, 235,000 bu. capacity at Smith Cove. The structure will be 285 x 64 ft. with 48 main bins, 4 conveyor belts, two to each berth. Estimated cost $900,000. J. R. West, Seattle, is engineer.

Grain Elevator—Sarnia Elevator Co., G. Leach, Mgr., Sarnia, Ont., is having plans prepared for addition to grain elevator at Waterfront. Estimated cost $400,000. C. D. Howe & Co., 712 Whalen Bldg., Port Arthur, are engineers. Grain handling equipment will be required.

Grain Elevator—Town of Meaford, Ont., is having plans prepared for the construction of a grain elevator, 1,000,000 bu. capacity. Estimated cost $400,000. C. D. Howe & Co., 712 Whaleh Bldg., Port Arthur, Ont., are engineers.

Grain Elevator — Wood Bros. Corp., Kansas City, Mo., plans the construction of a grain elevator at Kansas City, Kan. Estimated cost $1,000,000. Private plans.

Grain Storage Elevator—Watt Ragalsky Elevator Co., McPherson, Kan., awarded contract for the construction of a grain storage elevator, 150,000 bu. capacity to Jones-Hettelsater Construction Co., 708 Mutual Bldg., Kansas City, Mo. Estimated cost $40,000.

Grocery Plant—John Sexton & Co., Illinois and Orleans Sts., Chicago, Ill., awarded contract for superstructure of a 6 story, 100 x 125 ft. warehouse for grocery plant to W. G. McNulty & Bro., 58 East Washington St., Chicago. Estimated cost $350,000.

Ice Cream Plant—Anheuser Busch, 979 Brook Ave., New York, N. Y., plans the construction of a 2 story ice cream plant at 104th St. and 94th and Atlantic Aves., Long Island City. Estimated cost $130,000. J. E. Ross, 25 West 43rd St., New York, Archt.

Ice Plant—Berkshire Sanitary Ice Co., J. Everwein, 159 Seymour St., Pittsfield, Mass., awarded contract for the construction of an artificial ice plant on Curtis St. to W. L. Goetz, 16 Kenwood St., Pittsfield. Estimated cost $50,000.

Ice Plant—Brockton Ice & Coal Co., 426 Main St., Boston, Mass., will build a 1 story, 80 x 150 ft. ice plant on Lawrence St. Estimated cost $75,000. Funk & Wilcox, 26 Pemberton Sq., Boston, are engineers. Work will be done by separate contracts.

Ice Plant—Continental Ice Co., 7744 Jeffrey Ave., Chicago. Ill., awarded contract for a 2 story, 80 x 340 ft. ice plant at Port Huron, Mich. to Blome & Sinke Co., 33 South Clark St., Chicago, Ill. Estimated cost $200,000.

Ice Plant—R. H. Hill and J. D. Morton, Itasca, Tex., will build 18 ton ice plant at Brownsville, Tex. Estimated cost $25,000. Private plans.

Ice Plant—B. Leibal, 250 Badger Ave., Newark, N. J., is having plans prepared for a 2 story ice plant at 230-270 Badger Ave. Estimated cost $75,000. Private plans.

Ice Plant—Taylor-Easterling Co., Kennedy Bldg., Tulsa, Okla., plans the construction of a 10 ton raw water ice plant at Marshall, Okla. Estimated cost $25,000.

Ice Plant—Toledo Ice & Coal Co., J. M. Murphy, Pres., 2130 Jefferson Ave., Toledo, O., is having plans prepared for the construction of an ice plant on Woodruff St. Estimated cost $200,000. Alfred-Hahn, Close Realty Bldg., Toledo, O., is architect.

Ice Plant—Traders Finance Corp., Braniff Bldg., Oklahoma City, Okla., is having plans prepared for the construction of a 20 ton ice plant at Maud, Okla. Estimated cost $30,000. Private plans.

Ice Plant—Yale Utility Co., Yale, Okla., plans the construction of a 25 ton raw water ice plant. Estimated cost $40,000. Private plans.

Ice Plants—City Ice & Fuel Co., E. C. Balzhizer. V. Pres., 6611 Euclid Ave., Cleveland, O., awarded contract for a 1 story, 100 x 100 ft. ice plant at Willoughby, O., to Reaugh Construction Co., Engineers Bank Bldg., Cleveland, also plans ice plants at Westwood, C., Ft. Thomas, Ky., and Hilltop, O. Estimated cost $90,000, $75,000, $60,000 and $75,000 respectively. W. H. Schmid, 3220 Jefferson Ave., Cincinnati, is engineer.

Ice Storage Building—International Ice & Cold Storage Co., 905 Mercer St., Windsor, Ont., is having plans prepared for the construction of an ice storage building at Hanna and Mercer Sts. Estimated cost $1,000,000. Dangerfield & Winters, Huron and Erie Bldg., Windsor, are engineers.

Milk Depot—Waddington Milk Co., 102 West 24th St., New York, N. Y., plans the construction of a milk depot, stables, etc. at 60th St. and East 15th Ave., Brooklyn. Estimated cost $20,000. Bly & Hamann, 551 Nostrand Ave., Brooklyn, N. Y., are architects.

Milk Distribution Plant—Borden's Farm Products Co. of Illinois, F. Walmsley, 326 West Madison St., Chicago, Ill., will soon award contract for a 2 story milk distribution plant at 7300 Harrison St., Forest Park, Ill. E. E. Roberts, 105 North Clark St., Chicago, is architect.

Milk Distribution Plant — Ferndale Farms, Inc., 1678 Bergen St., Brooklyn, N. Y., will soon award contract for the construction of milk distribution plant at Liberty and Snediken Aves. Estimated cost $40,000. E. M. Adelsohn, 26 Court St., Brooklyn, is architect.

Milk Processing Plant—Owner, W. F. Phares, Chn. of Building Committee, c/o Farmers Trust Co., Maryville, Mo., is having preliminary plans prepared for the construction of a milk processing plant. Estimated cost $200,000. Work will be done under the supervision of Douthitt Engineering Co., 100 West Monroe St., Chicago, Ill., Engr.

Milling Plant Addition—Ralston Purina Co., 835 South 8th St., St. Louis, Mo., will soon award contract for an 8 story, 45 x 76 ft. milling plant and 13 story 45 x 76 ft. elevator at Fort Worth, Tex. Estimated cost $200,000. Private plans.

Packing Plant—P. Grasso, 240 College Ave., San Francisco, Calif., awarded contract for a 3 story packing plant at 4th and Bryant Sts. to S. A. Guisti, 200 Green St., San Francisco. Estimated cost $60,000.

Packing Plant—Henschein & McLaren, 1637 Prairie St., Chicago, Ill., Archts., will receive bids until Jan. 2 for a 2, 3 and 4 story, 225 x 450 ft. packing plant at Detroit, Mich., for B. H. Kroger Grocery & Baking Co., 813-17 Main St., Cincinnati, O.

Packing Plant—Kings County Packing Co., Reedly, Calif., awarded contract for the construction of a packing plant including cooling platform, etc. on Russett St. Ext., Oakland Calif. to Austin Co. of California, Russ Bldg., San Francisco. Estimated cost $500,000.

Packing Plant—Rosecrest Fruit Exchange, Portersville, Calif., awarded contract for a 1 story, 60 x 120 ft. packing plant to F. Wheldon, Porterville.

Packing Plant—Santiago Orange Growers' Assn., Orange, Tex., awarded contract for the construction of a packing plant, including 80 x 80 ft. pre-cooling plant, 50 x 120 ft. ice plant, etc. Estimated cost $150,000.

Packing Plant—Swift & Co., 824 South Vandeventer Ave., St. Louis, Mo., awarded contract for a 5 story packing plant at South Vandeventer Ave. to Kellermann Contracting Co., 422 Victoria Bldg., St. Louis. Estimated cost $45,000.

Pickling Plant — Empire State Pickling Co., B. E. Babcock, Pres., Phelps, N. Y., plans the construction of a 168 x 246 ft. plant to include 60 x 142 ft. canning room and 32 x 160 ft. corning room, etc. to replace fire loss. $400,000.

Refrigerator Cars—American Refrigerator Transit Co., Missouri Pacific Bldg., St. Louis, Mo., awarded contract for 1000 new refrigerator cars 80,000 lbs. capacity each to Pressed Steel Co., 310 South Michigan Blvd., Chicago, Ill. Estimated cost $3,000,000.

Salt Plant—Canadian Salt Co., G. M. Duck, Gen. Mgr., Sandwich St., Sandwich, Ont., plans the construction of a 35 x 65 ft. laboratory for salt plant. Machinery and equipment will be required.

Soda Factory—Bieber Polar Soda Co., 111 Summer St., Worcester, Mass., will soon award contract for a 1 story, 75 x 100 ft. addition to factory. Estimated cost $40,000.

Storage Building and Loading Shed—Hoffman Beverage Co., 406 Grove St., Newark, N. J., will soon award contract for the construction of a 6 story, 125 x 200 ft. storage building and loading shed at 9-13 21st St. Estimated cost $300,000. E. C. Epple, 44 Commerce St., Newark, is architect.

Sugar Refinery — National Artichoke Products Co., W. D. Fast, Pres., Big Rapid, Mich., plans the construction of an artichoke sugar refinery. Estimated cost $100,000. Architect not selected.

Tomato Packing and Shipping Plant—A. Woldert Co., Tyler, Tex., has acquired a site and plans the construction of a tomato packing and shipping plant at Yoakum.